Geology, Energy and Mineral Resource Inventory.
Saline Planning Unit

Bureau of Land Management

Bishop, California Area Office

1977

NOTE: The boundaries of the valuable for sodium and prospectively valuable for sodium areas have been modified by USGS, rendering Map Sheet IV of this report out of date. The updated boundaries are shown in Figure 5, Appendix V.

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I. INTRODUCTION

A. Location & Access. The Saline Planning Unit, an area of approximately 175,000 ha* (438,ooo acres, 684 square miles), is located in east-central Inyo County between Owens Valley and Death Valley National Monument (Fig. 1). The unit includes all of Saline Valley and parts of the Inyo, Nelson, Panamint, Last Chance and Saline mountain ranges.

Topographic maps covering the Saline Planning Unit include the Waucoba Spring, Last Chance Range, Waucoba Wash, Dry Mountain, New York Butte, Ubehebe Peak, and Marble Canyon 15-minute quadrangles. The area includes parts or all of the following 25 townships (Mount Diablo base line and meridian): T. 11-14 S., R. 37-40 E.; T. 15 S., R. 37-41 E.; T. 16 S., R. 38-41 E.

Saline Valley is accessible from the south by 65 km (40 miles) of dirt road (partly paved) which joins state highway 190 about 65 km (40 miles) east of Lone Pine. The valley is accessible from the north by a 65 km (40 mile) dirt road from Big Pine. A poor jeep road enters the southern part of the valley from Racetrack Valley to the east. An unpaved road extends the length of the valley along the base of the Inyo Mountains from which side roads go to mines, springs, and dwellings. An unpaved road climbs 13 km (eight miles) from

*ha = hectare = 10,000 square metres = 2.5 acres

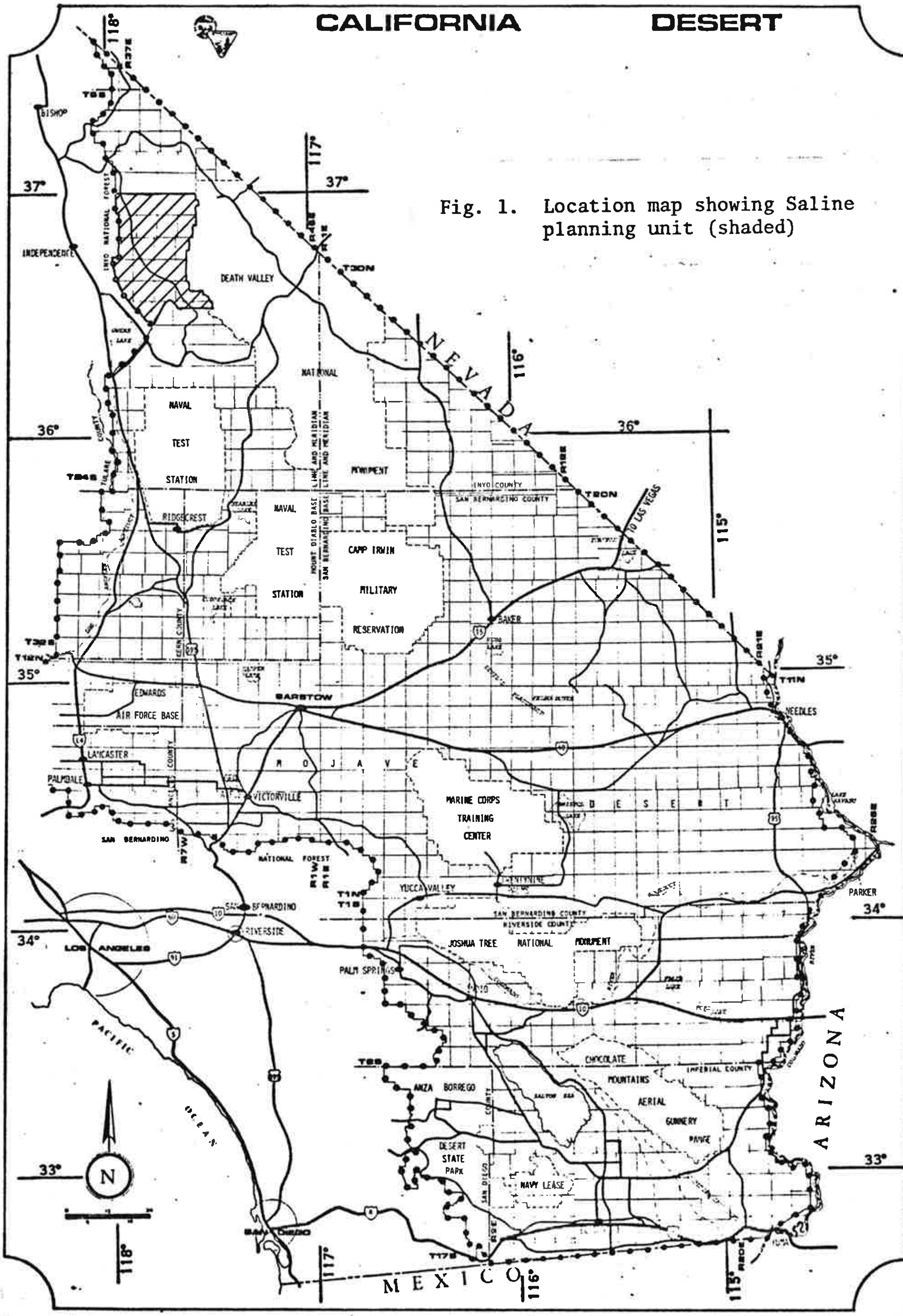


Fig. 1. Location map showing Saline planning unit (shaded)

Keeler to the Cerro Gordo Mine from which roads extend northwestward along the crest of the Inyo Mountains and northeastward into San Lucas and Bonham Canyons. Most of the planning unit is inaccessible by vehicle.

B. Previous Studies and Sources of Information. Until recently, the geology of the Saline Planning Unit was known only generally. Early workers gave general descriptions of the geology and mineral occurrences in the Cerro Gordo area (Raymond, 1873; Fairbanks, 1894, 1896) and of salt deposits in Saline and Owens Valley (Gale, 1914, 1915). Knopf (1914) published a preliminary report on mineral deposits and geologic structure at Cerro Gordo which was followed by a more comprehensive report (Knopf & Kirk, 1918). This report included a review of the geology and ore deposits at Cerro Gordo, a treatment of the stratigraphy, and a generalized geologic map of the Inyo Mountains area.

Knopf's report and map remained the most comprehensive work on the area until the 1950's when McAllister (1952, 1955, 1956) published geologic maps and reports on the geology, stratigraphy, and ore deposits of the Ubehebe Peak quadrangle and the Quartz Spring area. Merriam (1963) published the most detailed report to date on the geology and ore deposits in the Cerro Gordo district. His study included a geologic map of the southern half of the New York Butte quadrangle. Geologic

maps have since been published for the Waucoba Spring (Nelson, 1971), Dry Mountain (Burchfiel, 1969), and Waucoba Wash (Ross, 1967a) quadrangles. Ross (1967b) published a regional geologic map, which included the Saline Planning Unit, compiled from these published maps and unpublished maps of the Last Chance Range quadrangle and northern half of the New York Butte quadrangle. The geologic map that accompanies this report is compiled from these sources (Map Sheet II).

Discussions and listings of mineral occurrences in the Saline Planning Unit are given by Tucker and Sampson (1938), Norman and Stewart (1951), and Goodwin (1957). Page (1951) contributed a geologic report on talc occurrences in the Inyo Mountains. Lombardi (1963) and Hardie (1968) discussed the geochemistry of evaporite deposits in Saline Valley.

C. Present Study. As originally planned, the geology-energy-mineral resource inventory program in the Saline Planning Unit was to include five integrated surveys:

1. Compilation of Existing Data. This would take the form of a report which, among other things, would include a list of all known mineral occurrences and a geologic map at a scale of 1:62,500.
2. Paleontologic Survey. This survey would produce a report identifying all reported fossil species in the planning unit, a map of reported fossil occurrences, and a

bibliography on paleontologic resources in the planning unit and adjacent areas.

3. Leaseable Resources. This appraisal of leaseable commodities by the Conservation Division of the U.S. Geologic Survey would include drilling six core holes in the valley floor. The holes would be logged and cores and chip samples chemically and mineralogically analyzed.

4. Photogeologic Survey. This survey would produce a photogeologic map of the entire planning unit which would supplement the geologic map compiled by the U.S. Geological Survey. This survey would concentrate on lineaments which, when related to geology, areas of known mineralization, and geophysical anomalies, become one of several indicators of potential mineralization.

5. Airborne gamma-ray spectrometer and magnetometer surveys. Data from the magnetic survey would generate an isoline map of magnetic field strength showing areas of anomalously high or low magnetism and magnetic contrast. The gamma-ray spectrometer survey would produce isoline maps showing areas of anomalously high or low gamma radiation as indicators of the presence of uranium, thorium, and potassium in underlying rocks. These maps, when related to lithologic, structural, mineralogic, and other data as well as to one another, would be included among several indicators used to infer areas with favorable geologic environments

for economic mineral deposition. Data from these surveys would also be statistically analyzed.

6. Field Studies. This survey would consist of two types of field work--geologic and geophysical. Geologic field work would concentrate on areas of known or suspected mineralization and areas of special geologic significance. Geophysical field work would consist of ground magnetometer and gamma-ray spectrometer traverses over areas selected on the basis of geologic field work and results of other surveys.

Because all 175,000 ha of the planning unit could not be field investigated with available time and manpower, a systematic conceptual approach was used to select areas for field study. By inspection of geologic maps, areas were selected with geologic environments inferred to be favorable for mineralization. Criteria for selection included igneous contacts, possible structural controls such as fractures, fracture intersections and folds, and known mineral occurrences. Areas of special geologic significance as well as areas of particular interest to other resources were also selected. The selected areas total 40,000 ha (100,000 acres) and are shown on Map Sheet I. Using an estimated rate of 4,000 ha per man-month, ten man-months were needed for field data gathering.

There were 25 man-months available which were allocated as follows:

Geologic field work	10 mm
Geophysical field work	3 mm
Travel by car	3 mm
Data compilation & analysis	6 mm
URA	3 mm
	25 mm

Time commitments by various personnel were allocated as follows:

6 mm - Bishop Area Geologist
1 mm - Bakersfield District Geologist
18 mm - DPS Geologists
25 mm

Enactment of PL-94-579 (Federal Land Policy and Management Act) forced G-E-M Resources personnel of the Desert Plan Staff to discontinue inventory activities in the Saline Planning Unit in January, 1977, and begin a desert-wide study in order to meet the 1980 deadline set by Congress. As a result, the remote sensing and photogeologic surveys were cancelled. The compilation of existing data and paleontologic surveys were completed and reports on them are included with this report (Appendix II, III). Core drilling for the leaseable minerals survey was done in December, 1976, by the U.S.G.S. Conservation Division and their report is attached as Appendix V.

Geologic field work was discontinued January 27, 1977. Desert Plan Staff and Bishop Area geologists covered approximately 6,000 ha (15,000 acres) in slightly over three man-months (not including travel time). The areas investigated are shown on Map Sheet I. Field notes of inventoried areas are included as Appendix VI. No geophysical field work was done.

II. PHYSICAL PROFILE - GEOLOGY

A. GEOMORPHOLOGY. The Saline Planning Unit lies within the Great Basin physiographic province near the western margin. Saline Valley and its flanking mountain ranges have a northwesterly trend which is characteristic of the Inyo - Death Valley region. Northward-trending features are present but less common than in more typical Great Basin terrain to the north and east. Drainage in the area is closed and mostly intermittent. A few spring-fed streams such as those in Hunter and Beveridge Canyons flow all year over bedrock and disappear into alluvium which aprons the steep valley walls. Drainage into the playa is entirely subsurface except when flash floods inundate part of the playa. Such a flood occurred in late September, 1976.

Relief in the Saline Planning Unit is 3,062 metres (10,042 feet) commensurate with that of the eastern Sierra Nevada. The lowest measured elevation is 323 metres (1,059 feet) near Salt Lake; the highest measured elevation is 3,385 metres (11,101 feet) at Keynot Peak. North and east of Saline Valley, the Saline Range rises to 2,153 metres (7,063 feet) and the Panamint Range rises to 2,645 metres (8,674 feet) at Dry Mountain.

Saline Valley is a closed desert basin in a structural trough bounded on the southwest by normal faults. The valley, about

56 km (35 miles) long and 32 km (20 miles) wide, has a closure of 1,220 metres (4,000 feet) (elevation difference between the bottom and lowest pass out of the basin). The average altitude of the rim of the basin is about 2,134 metres (7,000 feet). The valley floor is an approximately circular salt-encrusted playa about 4,100 ha (16 square miles) in area (roughly the area enclosed by the 1,080 foot contour). The playa tilts slightly to the southwest which is probably a result of downward movement on faults along the base of the Inyo Mountains. A body of water called Salt Lake, covers approximately 100 ha (.4 square miles), in the southwest corner of the playa. According to Lombardi (1963), the lake is fed by freshwater springs which emerge from a three-foot fault scarp along the west edge of the playa. The water is concentrated by evaporation to a sodium chloride brine as it spreads over the playa.

The eastern slope of the Inyo Mountains exhibits topography comparable to the eastern Sierra Nevada. Steep slopes on the order of 30-40 degrees are covered with talus and are extremely difficult to traverse. The range is cut by transverse canyons 600 to 800 metres deep. The canyons are broad alluviated valleys in their upper reaches, becoming narrow gorges as they cross the steep fault scarp along the east edge of the range. The change in canyon morphology occurs at elevations between 1,525 and 1,830 metres (5,000 to 6,000 feet) which is also the approximate elevation of the San Lucas Fan and Lee Flat at the south end of the planning unit, and Whipoorwill and Jackass Flats north of

the unit. Alluviated surfaces along the crest of the Inyo Mountains indicate an old rolling land surface that existed before uplift of the Inyo Mountains. Alluvium on this surface is at least 6 metres (20 feet) thick (Flint, 1941). An excellent example of a remnant of this surface occurs on the ridge at the head of Beveridge Canyon.

These geomorphic features suggest three stages in the erosional history of the area. The alluvial surfaces along the Inyo Mountain Crest represent the first stage. The open valleys at the higher elevations which formed in response to an initial uplift of the range, mark the second stage. Features such as San Lucas Fan, Lee Flat, Whipoorwill Flat, and Jackass Flat may have formed at this time. The third stage, marked by narrow gorges, reflects renewed and rapid relative uplift along normal faults at the eastern edge of the Inyo Mountains. Knopf and Kirk (1917, p. 56-57) deduced three stages of erosion based on observations of alluvial fans and terraces. However, they explained these stages on the basis of climatic changes during Pleistocene time.

B. ROCK UNITS - PALEOZOIC AND MESOZOIC SEDIMENTARY ROCKS. Sedimentary rocks in the Saline Planning Unit range in age from late Precambrian to early middle Triassic, and have an aggregate thickness of 4,575 to 7,000 metres or 15,000 to 20,000 feet (Fig. 2). The reader is referred to detailed descriptions of the 29 formations given by Burchfiel (1969), McAllister (1952, 1955, 1956), Merriam (1963), Merriam and Hall (1957),

Age	Western Part	Thickness (metres)	Eastern Part	Thickness (metres)
TRIASSIC AND JURASSIC (?)	Volcanic rocks	670		
TRIASSIC	Marine rocks	550		
	UNCONFORMITY		(Top not exposed)	
PERMIAN	Owens Valley Formation	550	Owens Valley Formation	900±
PENNSYLVANIAN	Keeler Canyon Formation	670±	Keeler Canyon Formation	1200
MISSISSIPPIAN	Rest Spring Shale	760	Rest Spring Shale	90?
	Perdido Formation	90-180	Perdido Formation	190
	UNCONFORMITY		Tin Mountain Limestone	145
DEVONIAN			Lost Burro Formation	465
SILURIAN	Vaughn Gulch Limestone and Sunday Canyon Formation	210-460	Hidden Valley Dolomite	415
ORDOVICIAN	Ely Springs Dolomite	60-150	Ely Springs Dolomite	285
	Johnson Spring Formation	30-120	Eureka Quartzite	120
	Barrel Spring Formation	30-60		
	Mazourka Group	300	Pogonip Group	440
CAMBRIAN	Tamarack Canyon Dolomite	270	Nopah Formation	490
	Lead Gulch Formation	90		
	Bonanza King Dolomite	850	Bonanza King Dolomite	1000
	Monola Formation	380	Carrara Formation	500
	Mule Spring Limestone	300		
	Saline Valley Formation	260		
	Harkless Formation	610	Zabriskie Quartzite	415±
	Poleta Formation	365	Wood Canyon Formation	400±
PRECAMBRIAN	Campito Formation	1070	(Base not exposed)	
	Deep Spring Formation	460		
	Reed Dolomite	610		
	Wyman Formation (Base not exposed)	2740		

Fig. 2. Pre-Tertiary rocks in the Saline Planning Unit. (Modified from Stewart and others, 1966)

Nelson (1962, 1965, 1971), Ross (1963, 1965, 1966, 1967a) and Stewart (1970).

Cambrian and Ordovician strata have been divided into an eastern and a western region. This division is based partly on lithologic differences, particularly in Cambrian rocks, and partly on differences in nomenclature.

Paleozoic strata are commonly altered and metamorphosed in areas where they are severely deformed or intruded by igneous rocks. Shaly rocks are metamorphosed to phyllites and hornfelses. Examples can be found in the Nelson Range where Rest Springs Shale occurs as a chiastolite hornfels, or around the Trepier mine where it occurs as a staurolite-bearing schist. Carbonate rocks are altered by simple recrystallization to marble, by silicification such as at the Burgess Mine, or metamorphism to garnet or wollastonite-bearing tactites such as in the area south of New York Butte or in the Nelson Range north of the Cerrusite Mine.

Mesozoic Plutonic Rocks. Mesozoic granite rocks crop out extensively in the Inyo, Nelson and Panamint ranges (Map Sheet II). Most of these bodies are quartz monzonite, but granite, syenite, alaskite, monzonite, granodiorite, syenodiorite, quartz diorite, and diorite also occur. Units that have been mapped in the Saline Planning Unit are the Hunter Mountain Quartz Monzonite, Pat Keyes Pluton, Quartz Monzonite of Paiute Monument, Quartz Monzonite of Papoose Flat, and Alaskite of Lead Canyon. Most of the granitic rocks in the area have been assigned at least

tentatively to one of these units.

The granitic rocks are very important from a minerals standpoint. Most known mineral deposits are concentrated around the margins of these plutons in veins and contact metamorphic deposits. Crystallizing magma, from which these rocks formed, provided the hydrothermal fluids and heat responsible for formation of mineral deposits. An understanding of the geometry, contact and age relations, petrographic character, and chemistry of these rocks is critical in order to understand their associated mineral deposits. Unfortunately, data of these kinds are very sketchy.

Hunter Mountain Quartz Monzonite. The Hunter Mountain Quartz Monzonite was defined and mapped by McAllister (1952, 1955, 1956). It is the most extensive of all the plutonic units, and underlies the rolling highland of Hunter Mountain, extending northward in the Panamint Range to Ubehebe Peak and northwestward along the Nelson Range. Three small outliers near the southeast end of Saline Valley are Hunter Mountain Quartz Monzonite according to McAllister (1956). Burchfiel (1969) mapped some inliers and small stock southeast of Warm Springs as Hunter Mountain Quartz Monzonite.

McAllister (1952, 1955, 1956) gave petrographic descriptions and modes of the Hunter Mountain Quartz Monzonite. Typically, the rock is a medium to coarse-grained light gray hornblende quartz monzonite with the following approximate mineral percentages; 40 percent orthoclase, 40 percent plagioclase (oligoclase),

14 percent quartz, 4 percent hornblende, 1 percent magnetite, 1 percent sphene, and traces of biotite, apatite, epidote, and sericite.

McAllister (1956) mapped a "calcic facies" east of Dodd Spring in the southeastern part of the planning unit which include olivine gabbro (80 percent bytownite, 10 percent olivine, 5 percent augite, 3 percent magnetite, and 2 percent biotite and apatite); pyroxene-biotite gabbro (73 percent labradorite, 16 percent biotite, 8 percent augite, 2 percent magnetite, 1 percent apatite, and traces of orthoclase); and olivine monzonite (54 percent andesine, 37 percent orthoclase, 3 percent olivine, 3 percent augite, 3 percent biotite, and 1 percent magnetite and apatite). Syenodiorite, monzonite, syenite, lamprophyre, aplite, pegmatite, diorite, quartz diorite, granodiorite and granite form "minor facies" of the Hunter Mountain Quartz Monzonite (McAllister, 1956).

Burchfiel (1969) mapped two inliers and a small stock southeast of Warm Springs. He reported two modes of samples from these bodies:

1. 55 percent potassium feldspar, 30 percent sodic plagioclase, 10 percent quartz and 5 percent hornblende;
2. 45 percent potassium feldspar, 30 percent sodic plagioclase, 5-7 percent quartz and 15-20 percent hornblende.

<u>Pat Keyes Pluton</u>. The Pat Keyes pluton was mapped by Ross (1967a) in the Waucoba Wash quadrangle. It extends into the

Independence and Lone Pine quadrangles (Ross, 1965), and the New York Butte Quadrangle (Ross, 1967b). Ross (1965) correlated this pluton with the Hunter Mountain Quartz Monzonite on the basis of contact relations and petrographic character.

In the Independence quadrangle (Ross, 1965) the unit typically forms gray, bold, highly-fractured, rubbly outcrops in areas of rugged relief. The rock is equigranular, locally weakly porphyritic or seriate, medium-grained, and is commonly rich in mafic inclusions. The pale-red-purple color of the potassium feldspar is the most conspicuous feature of this unit. The average mode of the Pat Keyes Pluton in the Independence quadrangle is 43 percent plagioclase (oligoclase-andesine), 23 percent potassium feldspar, and 15 percent quartz, with dark minerals ranging from 10 percent to 30 percent (roughly equal amounts of biotite and hornblende or hornblende slightly predominating). The average rock lies on the boundary between quartz monzonite and granodiorite. A dioritic border facies occurs at the western margin of the pluton in the Independence quadrangle.

Desert Plan Staff (DPS) geologists have noted similar rocks in the New York Butte quadrangle. At the Keynot Mine the rock is a gray, medium-grained, equigranular quartz monzonite with approximately 15-20 percent hornblende and biotite (chiefly hornblende), 15 percent quartz, and roughly equal amounts of

plagioclase and pink potassium feldspar.

Dunne (1971) showed that the Pat Keyes pluton was zoned from seriate quartz monzonite in the core (average composition 19.7 percent quartz, 29.4 percent K-feldspar; 40.6 percent oligoclase; 5.3 percent biotite, 3.3 percent hornblende) to granular "monzonite-diorite" at the margins (average composition 7.2 percent quartz, 23.1 percent K-feldspar, 46.6 percent oligoclase, 8.4 percent clinopyroxine, 7.5 percent biotite, 3.7 percent hornblende). Hornblende hornfels facies contact metamorphic rocks indicate the pluton was emplaced at a total pressure of only 0.8 kilobar, or a depth of about 3 kilometers. Dunne correlated the Pat Keyes pluton to the Hunter Mountain quartz monzonite on the basis of its low quartz content.

Quartz Monzonite of Paiute Monument. This unit surrounds the metamorphic pendant in the Willow Creek area in the Waucoba Wash quadrangle (Ross, 1967a), and extends westward into the Independence quadrangle (Ross, 1965). A second body, surrounded by rocks of the Pat Keyes pluton, occurs as an elongated, northwest-trending body in the northern part of the New York Butte quadrangle (Ross, 1967b). The Paiute Monument pluton is younger than the Pat Keyes Pluton on the basis of contact relations and radiometric ages (Ross, 1965).

Ross (1965) described the Paiute Monument Pluton as a very coarse-grained seriate quartz monzonite that forms light gray

bouldery outcrops. Pale red potassium feldspar crystals range up to 25 mm* across; quartz and plagioclase crystals range from 3 to 10 mm. Mafic inclusions are widespread, but not as common as in the Pat Keyes Pluton. The average modal composition of the Paiute Monument pluton is 35 percent calcic oligoclase, 32 percent K-feldspar, 25 percent quartz, 4 percent biotite, 1 percent hornblende, and 2 percent opaques, sphene, zircon, apatite and allanite. The Paiute Monument quartz monzonite was not observed by DPS geologists.

Papoose Flat Pluton. The Papoose Flat pluton forms a wedge-shaped body of about 30 square miles in the Waucoba Wash, Waucoba Spring, Waucoba Mountain, and Independence quadrangles. Only a narrow eastward trending "tail" about 4 km (2.5 miles) long crops out within the planning unit in the northwest corner. The pluton forms light gray bouldery outcrops of coarse-grained porphyritic quartz monzonite. K-feldspar megacrysts up to 50 mm long are common. Ross (1965) gave an average mode of 42 percent calcic oligoclase, 19 percent potassium feldspar, 33 percent quartz, and 6 percent biotite, hornblende, muscovite and other accessory minerals.

The pluton forms steeply discordant contacts with Cambrian strata at its eastern end, and concordant contacts around the western end where strata are tectonically thinned to about ten percent of their original thickness. Nelson and others (1972)

* mm = millimetre = 0.04 in.

suggest the pluton penetrated discordantly lower formations of an anticline and formed a "blister" in the limb beneath the stretched higher formations.

The Papoose Flat pluton is similar in lithology and age to plutons occurring along the Sierra Nevada Crest from Mount Whitney to Sonora Pass (e.g., Cathedral Peak Quartz Monzonite at Tuolome Meadows), and to quartz monzonites throughout the Mojave Desert (e.g. Granite Mountains Pluton, Teutonia Quartz Monzonite in the East Mojave Planning Units).

Alaskite of Lead Canyon. Ross (1967a) mapped a small body of alaskite in Lead Canyon in the northwestern part of the planning unit. He did not describe this body, but he did describe some alaskite in the Independence quadranglc (Ross, 1965) as fine to medium-grained rocks composed of sodic plagioclase, potassium-feldspar and quartz with little or no dark minerals. They form blocky outcrops and weather into sharply angular fragments, in contrast to the well-rounded bouldery appearance of other granitic bodies.

Other Plutonic Rocks. Several small stocks and dikes penetrate Silurian to Triassic strata in the southern Inyo Mountains. Most are part of the Pat Keyes-Hunter Mountain quartz monzonite. Monzonite porphyry occurs in the small stock at the Hart Mine and in the Union Dike at the Cerro Gordo mine. The Union Dike is the probable source of much of the lead-silver-zinc ore at Cerro Gordo (Merriam, 1963).

Dark-colored dikes penetrate Paleozoic strata throughout the planning unit. In the Cerro Gordo area, dark green andesite-dacite porphyry dikes occur commonly and are often associated with small mineral deposits. At Cerro Gordo, the Jefferson Dike, composed of diabase, is intimately associated with one of the richest lead-silver-zinc ore-shoots. The dark-colored dikes are the youngest intrusive rocks in the area (Merriam, 1963).

Age of Plutonic Rocks. Radiometric ages of plutonic rocks in the Saline Planning Unit are listed in Fig. 3. The Papoose Flat pluton is clearly Cretaceous. Because alaskite dikes cut the Papoose Flat pluton (Ross, 1965), the alaskite of Lead Canyon is also assigned a Cretaceous age. The Paiute Monument pluton is assigned a Jurassic age even though one age is late Triassic. The Pat Keyes-Hunter Mountain quartz monzonite is assigned to the Triassic. The 156 million year date from the Hunter Mountain (?) quartz monzonite is from the body southeast of Warm Springs. Either those rocks are not part of the Hunter Mountain quartz monzonite, or the radiometric age has been masked by a later thermal event. The 134 million year age from New York Butte suggests that part or all of that pluton may be younger than the Pat Keyes-Hunter Mountain quartz monzonite.

Cenozoic Volcanic and Sedimentary Deposits. A section of volcanic

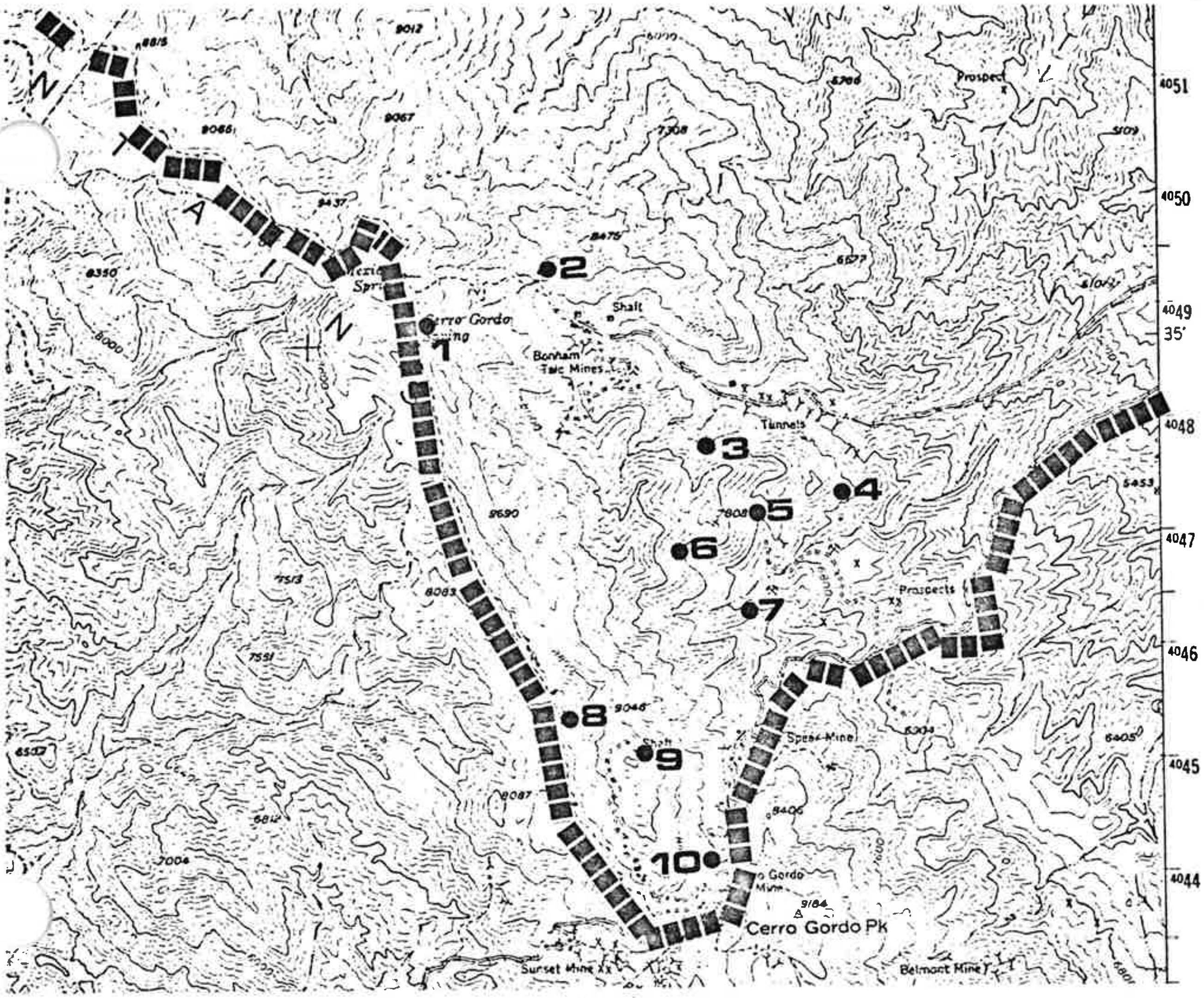
Pluton	Age (m.y.)	Dating Method	Period	Reference
Papoose Flat	81	K-Ar	Cretaceous	Ross (1965)
Papoose Flat	75	K-Ar	Cretaceous	Ross (1965)
Paiute Monument	156	K-Ar	Jurassic	Ross (1965)
Paiute Monument	157	K-Ar	Jurassic	Ross (1965)
Paiute Monument	170±20	Pb-alpha	Jurassic	Ross (1965)
Paiute Monument	190±20	Pb-alpha	Triassic	Ross (1965)
Pat Keyes	210±20	Pb-alpha	Triassic	Ross (1965)
Pat Keyes	183	Rb-Sr	Triassic	Dunne (1971)
Hunter Mountain	190	Pb-alpha	Triassic	Ross (1965)
Hunter Mountain(?)	156	K-Ar	Jurassic	C.D.M.G. (written communication, 1977)
New York Butte	134	K-Ar	Jurassic-Cretaceous	C.D.M.G. (written communication, 1977)

Fig. 3. Radiometric ages of plutonic rocks in the Saline Planning Unit.

rocks up to 300 metres (1,000 feet) thick underlies most of the Saline Range in the northern part of the planning unit. These rocks consist of layers of tuff, cinders, and agglomerate, capped by a vast flood of black, olivine-bearing volcanic flows. These flows would be classified as basalt in the field, but chemical analyses published by Ross (1970) indicate an average K_2O content of 1.7 percent and an SiO_2 content ranging from 47 to 56 percent. Because of their high K_2O contents, these rocks were classified as trachyandesite by Ross (1970). Ross also described some unusual trachyandesite intrusive plugs with pegmatitic cores and fine-grained margins exposed in an inlier in the caprock. The volcanic rocks of the Saline Range are Plio-pleistocene in age. Potassium-argon ages range from three to six million years (California Division Mines and Geology written communication, 1977).

Quaternary sediments consist chiefly of valley fill and alluvial fan material. Relatively minor units include playa deposits, windblown sand, landslide deposits, talus, and calcareous spring deposits.

C. PALEONTOLOGY. Fossiliferous strata occur throughout the Paleozoic section in the Saline Planning Unit. Occurrences have been described by Merriam (1963), Merriam and Hall (1957), McAllister (1952, 1955), Nelson (1962, 1966), and others. The only fossil localities that have been mapped are in the south



Topography from USGS New York Butte, Quadrangle, 1950

Figure 4. Fossil localities in the Cerro Gordo area (modified from Merriam, 1963)

1. Coral locality in Tin Mountain Limestone 700 feet north of Belshaw Spring.
2. Corals in Lost Burro Formation near White Mountain Talc Mine.
3. Silurian fossils in Hidden Valley Dolomite 4800 feet southeast of White Mountain Talc Mine.
4. Fossils in Pogonip Limestone south side of Bonham Canyon
5. Silurian fossils in Hidden Valley Dolomite 7,300 feet southeast of White Mountain Talc Mine.
6. Corals in Lost Burro formation 6,500 feet north-northwest of the Ella Mine.
7. Fossils in Ely Springs (?) dolomite on ridge 4,200 feet north of the Ella Mine.
8. Invertebrate fossils, plant remains, and shark teeth in lower Rest Springs Shale on Pipeline trail 7,000 feet northwest of Cerro Gordo.
9. Fossils in Rest Springs Shale near Hart Mine.
10. Fusulinids in lower Keeler Canyon Formation.

half of the New York Butte Quadrangle (Merriam, 1963). These localities are shown on Figure 4.

Mr. Patrick J. Kennedy of the University of California, Riverside, working under contract for the Desert Plan Staff, has prepared a report on paleontologic resources of the Saline Planning Unit which includes a bibliography. His report is included with this report as Appendix III.

D. STRUCTURE AND TECTONICS. Folding and Faulting in the Cerro Gordo Area. The following discussion is based on descriptions by Merriam (1963) and on field observations by DPS geologist.

The structure of the southern Inyo Mountains is dominated by an assymetric anticline called the Cerro Gordo anticline. This fold is cut by the north-south-trending Cerro Gordo and San Lucas faults, and by northwest-trending normal faults. The intersection of the axis of the anticline with the Cerro Gordo and San Lucas faults formed the structural control for deposition of ore at the Cerro Gordo mine. Figure 5 is a generalized southwest-northeast cross section through the anticline (modified from Merriam, 1963). The age of the anticline and faults is post-middle Triassic and pre-Cretaceous.

The Cerro Gordo anticline extends from south of Cerro Gordo northward to Hunter Canyon, a distance of 24 km (Merriam, 1963). The axis trends approximately N. 20 W. and plunges

to the south. The fold is assymetrical with the western limb dipping more steeply than the eastern limb. The anticline is cut by the north-south Cerro Gordo and San Lucas faults, the Cerro Gordo fault being west of the San Lucas. At Cerro Gordo, a wedge of Keeler Canyon formation was dropped several hundred feet between the two faults, indicating the faults form a graben. The Cerro Gordo fault is the "master fault" in the Cerro Gordo mine. It extends northward at least to Bonham Canyon. Several small copper deposits occur along the fault. The San Lucas fault appears to be unmineralized.

Northwest-trending faults predominate north of Cerro Gordo. Two such faults form structural boundaries to the area of talc mineralization in Bonham Canyon.

North of Cerro Gordo, folding becomes more compressed and complicated. In upper Bonham Canyon and Daisy Canyon. Vertical isoclinal folds with amplitudes on the order of 300 metres (1,000 feet) can be seen in the walls of the deeply-incised canyons. Spectacular disharmonic folding at a scale ranging from several tens of meters down to a few centimeters also occurs in this area, and is best observed in the thinly-laminated limestones of the Lost Burro formation.

Merriam (1963) interpreted the disharmonic folds as subsidiary drag folds associated with the major folding. However, Sylvester and Babcock (1975) established three distinct

episodes of deformation of similar age rocks in the northern Inyo and White Mountains, while Gulliver (1976) was able to distinguish four episodes of deformation in the Talc City Hills near Darwin. It appears likely that multiphase folding also occurred in the southern Inyo Mountains.

In the Nelson Range northeast of Cerro Gordo, Pennsylvanian and Permian strata are deformed into large and spectacular recumbent folds. Excellent examples can be seen along the road between Lee Flat and San Lucas Canyon.

Last Chance Thrust. A major thrust fault occurs in the Dry Mountain quadrangle (Burchfiel, 1969), the Waucoba Wash quadrangle (Ross, 1976a), and the Waucoba Spring quadrangle (Nelson, 1971). Stewart and others (1966) named this the Last Chance Thrust and traced it over an area of 103,600 ha (400 square miles) in the White, Inyo, Saline and Last Chance Ranges and Eureka Valley. Late Precambrian, Cambrian and Ordovician strata form the sole of the upper plate and are thrust over Mississippian Rest Springs shale and locally Silurian Hidden Valley Dolomite. The upper plate was thrust eastward relative to the lower plate at least 32 km (20 miles) (Stewart and others, 1966). No known genetic relationship exists between the Last Chance Thrust and any mineral deposits.

Recent Faulting. Two zones of recent faulting occur in the

Saline Valley area. A northwest to north-northwest zone follows the base of the Nelson and Inyo ranges. Movement along faults in this zone formed the impressive escarpment that rises above Saline Valley. The second zone is defined by numerous northeast-trending normal faults in the Saline and Panamint Ranges and the trough-like corridor between these ranges. The two zones intersect east of Willow Creek Camp. Recent faulting is indicated in both zones where faults cutting bedrocks also cut Quaternary valley fill. An excellent example can be observed in S. 33, T. 15 S., R. 40 E. where a wash follows a recent fault at right angles to the prevailing drainage direction. The alluvial surface northeast of this fault appears to have been downdropped three to five metres relative to the southwest side. Recent faulting is also indicated by the gentle southwest tilting of the Saline Valley playa.

The mechanics of faulting in Saline Valley is poorly understood. Magnitudes and direction of displacement, and the relationship between the northwest and northeast fault zones are not known. Detailed field mapping and seismic refraction studies might provide a better understanding of these problems. What is known indicates that Saline Valley was formed by movement on the northwest-trending fault zone, the Saline Valley block having rotated several thousand feet downward relative to the Inyo Mountain-Nelson Range block, forming a

wedge-shaped trough in cross section.

E. GEOPHYSICS. Two regional gravity surveys have been conducted in the Saline Valley area (Mabey, 1963; Chapman and others, 1971). Both surveys included Bouguer anomaly maps and brief interpretations of anomalies observed in the Saline Valley area. Chapman's survey was based on more measurements than Mabey's and consequently shows more detail. The Saline Valley portions of Mabey's and Chapman's maps are reproduced here as Figures 6 and 7 respectively.

Mabey's (1963) discussion of gravity anomalies in Saline Valley is reprinted as follows:

> "The maximum gravity relief across Saline Valley is more than 40 mgals; however, the gravity gradient that extends onto the bedrock outcrops along the margins of Saline Valley cannot be explained by low-density material underlying the valley. This is particularly apparent along the north side of the Nelson Range where there is a northward decrease in the anomaly of about 15 mgals over a distance of about 3½ miles between stations on bedrock. This gradient is nearly normal to the westward increase in regional elevation and does not appear to be related to the regional or local topography.
>
> The cause of this bedrock anomaly is not apparent from a consideration of the density of the surface rocks. The low gravity values occur over the large body of quartz monzonite that trends northwest from the Panamint Range across Saline Valley into the Inyo Mountains, and the higher values to the south are on Paleozoic sedimentary rock. The densities of the two rock types at the surface are about equal. The relatively low anomaly values over the intrusive body may

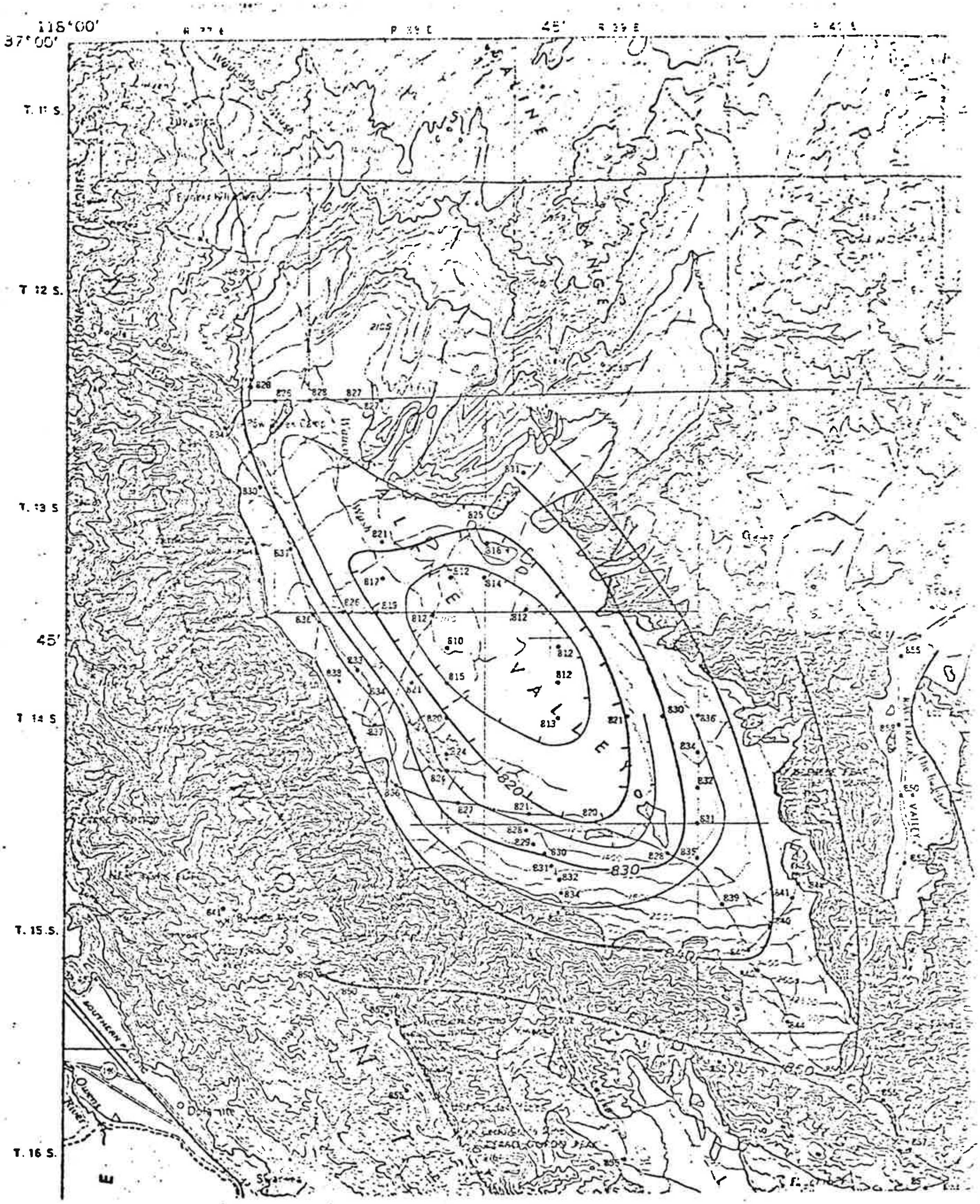


Fig. 6. Bouguer anomaly map of the Saline Valley area. From Mabey (1963). Scale 1:250,000.

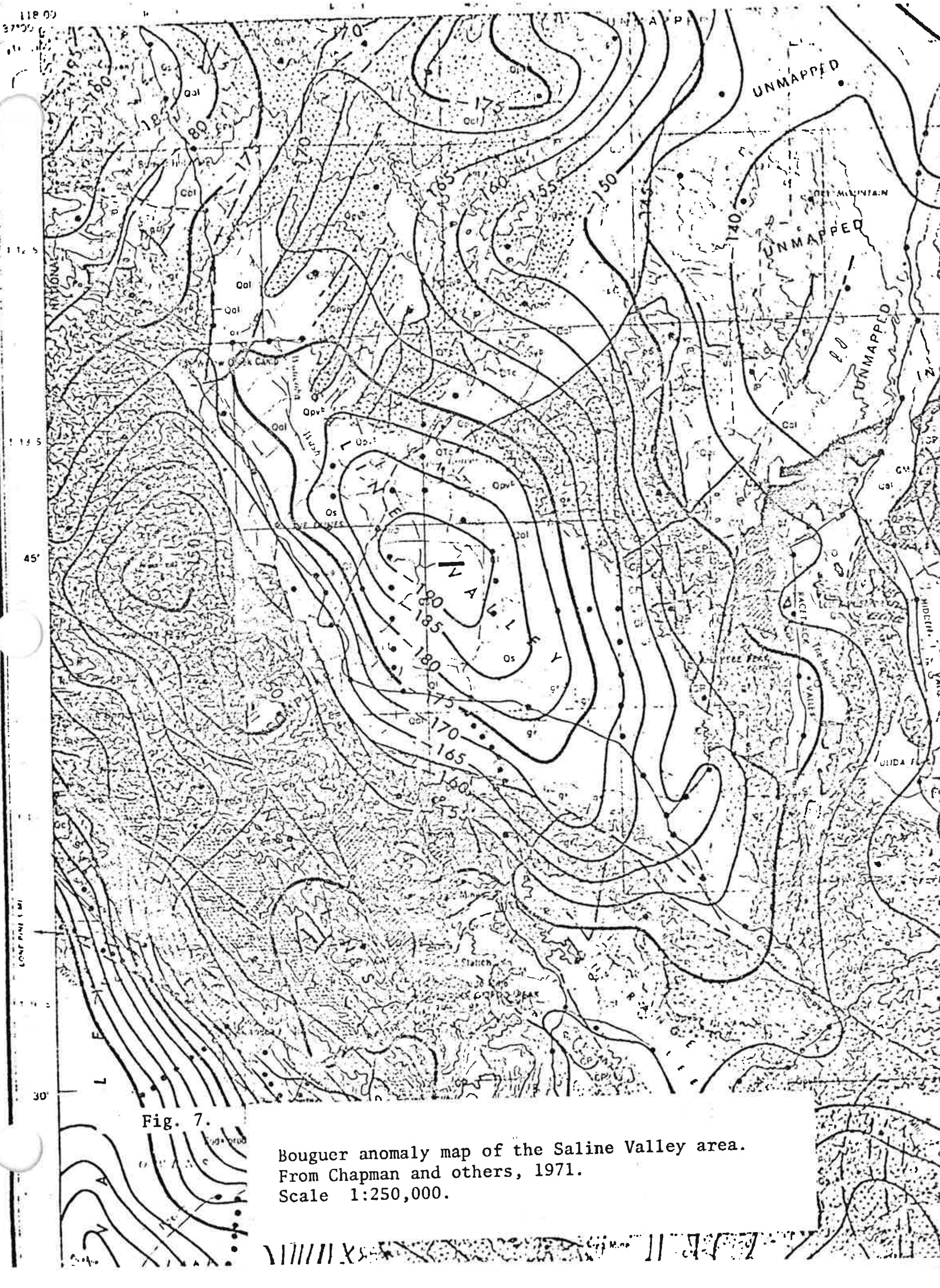


Fig. 7.

Bouguer anomaly map of the Saline Valley area.
From Chapman and others, 1971.
Scale 1:250,000.

result from the quartz monzonite replacing a more dense metamorphic basement complex at depth, or the sedimentary rock may occur in a large roof pendant, which, in the lower part contains a large volume of more dense metamorphic rocks.

The steep gravity gradient along the west side of Saline Valley at the base of the Inyo Mountains is probably a near-surface effect and indicates about 2,000 feet of Cenozoic fill underlying the valley near the range front. Only a few hundred feet of Cenozoic rocks are in contact with bedrock along the fault zone at the base of the Nelson range, but a local gravity gradient, probably produced by a fault within the basin, was observed about 2 miles north of the range. There is no gravity evidence of faulting at the Panamint Range but the steepening of gradient about 2 miles from the range front may be related to a fault in the valley.

The maximum thickness of Cenozoic rocks in the valley occurs in the area north of the lake, where the fill is probably about 3,000 feet thick. The gravity data indicate that the rocks exposed along the axis of the valley are part of the basin fill."

Chapman's (1971) discussion of gravity anomalies in Saline Valley is here reproduced as follows:

"Granitic rocks are exposed in a large area at the northern end of Panamint Valley in the vicinity of Hunter Mountain, but gravity values in this area show little exception to the northwest-dipping regional trend. Farther northwest, Saline Valley is marked by a very prominent northwest-trending gravity minimum. The local gravity relief in Saline Valley is probably more than 40 mgal. However, as pointed out by Mabey (1963), the gravity gradients that extend onto bedrock outcrops along the margins of the valley cannot be explained by low-density material underlying the valley. These gradients are observed

over bedrock outcrops along the north side of the Nelson Range where Mabey (1968) estimated a northward decrease in the anomaly of about 15 mgal in 3½ miles and on the northeast side of Saline Valley where there is a westward decrease of about 14 mgal in 2 miles. Only a part of these decreases in anomaly values toward the north and west could be caused by steepening of the regional gravity gradients. One possible explanation is that Saline Valley is underlain principally by granitic rocks and that more dense metamorphic rocks are present in and underlying the Inyo Mountains, the Nelson Range, and the Panamint Range to the west, south, and northeast, respectively. Another possibility is that the Saline Valley area is underlain at depth by a large granitic intrusive mass with a lower density than that of the usual Mesozoic plutonic basement rocks.

Steep gravity gradients on the edges of and within Saline Valley on the west and south sides in particular suggest that multiple fault zones exist and are generally parallel both to the Inyo Mountains and the Nelson Range. There is not, however, positive gravity evidence for a fault on the Panamint Range side of the valley. On the basis of the gravity data, Mabey (1963) estimated a maximum thickness of about 3,000 feet of Cenozoic sedimentary rocks in the valley north of the dry lake.

A nose in the gravity contours extends westward from the positive gravity anomally associated with the Panamint Range into the southeastern part of the Saline Range, north of Saline Valley, where it is joined by a northward-trending positive anomaly from the Inyo Mountains. Much of the Saline Range is covered by Cenozoic basaltic volcanic rocks, but the presence of scattered outcrops of Paleozoic sedimentary rocks suggests that these rocks near the surface may be the chief cause of the positive gravity anomalies."

No published seismic or magnetic data exist for the Saline Valley area. A magnetometer survey of the area would be useful as one of several indicators of possible mineralized areas. A

seismic survey would be useful in interpreting the shape and structure of the bedrock floor of Saline Valley.

F. GEOLOGIC HAZARDS. Geologic hazards should be considered in developing a multiple land use plan. Earthquakes, flash floods, and mass wasting are among the possible geologic hazards in Saline Valley.

Evidence for recent faulting has already been described in this report. Where there has been recent faulting, the probability of earthquakes is very high. The areas with the greatest earthquake threat lies along the base of the Inyo and Nelson Ranges, and in the Lower Warm Spring vicinity.

Flashfloods are a potential hazard on alluvial fans. When rainfall is very heavy, water issuing from narrow mountain canyons can flood large parts of the valley transporting large boulders several miles from the mouths of canyons. Heavy rains in late September 1976, flooded much of the playa in Saline Valley and washed out roads in several places.

Landslides, rock falls, and other forms of mass wasting are likely to occur in areas of oversteepened slopes such as along the steep escarpment in the Inyo Mountains. Landslides and rockfalls are likely to occur during or after earthquakes, and when soils are saturated from rain or melting snow. The large knoll that projects from the escarpment west of Salt Lake may have formed by landsliding.

III. PRESENT SITUATION - MINERALS

The Saline Valley area has long been of interest to the mining industry. The area contains commerical or potentially commerical deposits of gold, silver, copper, lead, zinc, tungsten, talc, and salines. Recently, Saline Valley has been of considerable interest for its potential geothermal resources. This section describes mineral occurrences in the planning unit and summarizes their economic potential on the basis of field studies and published descriptions. The known mineral deposits in the planning unit are listed in Tables 1 and 2, Appendix I. More information can be found in the references cited for each occurrence and in the field notes (Appendix VI). In the following narrative, locatable, leaseable, and saleable commodities are discussed separately.

A. Locatable Commodities. The Saline Planning Unit is here divided into eight locatable mineral areas on the basis of geographic distribution and type of mineralization (Map Sheet III). Nearly all of the known mineral deposits in the planning unit are in these areas. This does not mean that no mineral deposits exist outside these mineral areas, but that there is no record of deposits in published sources.

Mineral Area 1 - Lead Canyon

This area in the northwestern corner of the planning unit is underlain by Cambrian strata which form the upper plate of the Last Chance Thrust. Principal deposits are the Blue Monster,

Bunker Hill, Waucoba Tungsten, and Morningstar.

The lead-silver-gold deposits at the Bunker Hill and Blue Monster mines are in oxidized quartz veins in carbonate rocks that were worked by shafts adits and open cuts. The Blue Monster mine shipped 45 tonnes* of ore in 1935 reported to assay $100 per tonne in lead and silver.

The Waucoba tungsten mine, originally located as a copper prospect, produced some high grade tungsten ore during World War II (Calif. Div. Mines, 1955). The deposit consists of irregular discontinuous scheelite bands in argillite of the Harkless formation. The ore reportedly contained one to two percent WO_3 (Norman and Stewart, 1951).

The Morningstar claims consist of several east-west-trending quartz veins that cut Campito formation. These veins have been explored by several shallow open cuts and short adits. No minerals other than limonite were observed in the vein, but it may contain some gold.

Mineral Area 2 - Willow Creek - Snowflake

This area includes two areas of talc mineralization - the Snowflake mine and the Willow Creek Camp area. Both areas contain deposits of high quality talc in metamorphosed carbonate rocks near intrusive contacts with granitic rocks.

The Snowflake mine, located on top of a precipitous ridge just

*tonne = 1,000 kg = 1.1 ton

north of the mouth of Beveridge Canyon, consists of two open pits each about 30 metres long and three to six metres deep. The deposits are in recrystallized Lost Burro formation adjacent to Pat Keyes Quartz Monzonite.

Mines in the Willow Creek area, include the Gray Eagle, White Eagle and Doris D., and have been mapped and described by Page (1951). All of these deposits contain substantial reserves. The most significant is the White Eagle which is currently being redeveloped by the owners. Several truckloads of talc have been shipped from the White Eagle since September, 1976. The caretaker at the mine reports that a company (name unknown) has shown interest in the Gray Eagle Mine.

Mineral Area 3 - Beveridge

Several gold, silver, lead, and copper deposits occur in this area. The principal deposits are the Keystone (Keynot), Burgess, Bighorn, Trepier, and Metro (Big Silver). There was considerable mining activity in the 1870's and 1880's in this area, but most operations were either exploratory or promotional. The only mine with any sustained production was the Keystone which produced a total of about $500,000 in gold (Norman and Stewart, 1951). During the late 1870's and early 1880's, the mine produced $10,000 in gold per month. Only the ore that carried $40 of gold per ton was milled. Ore that was of lower grade was piled on the dump. As a result the dump contains about $225,000

in gold assaying eight dollars per ton (Flint, 1941). Using a current price of approximately $140 per ounce, the dump is worth about one million dollars at $32 per ton. Flint (1941) also reports that ore as rich as one ounce per ton exists in parts of the vein not yet mined.

Broad contact aureoles in the vicinities of the Burgess mine, and the upper parts of Craig and Hunter Canyons were studied by DPS and Bishop area geologists. Carbonate rocks are highly silicified and metamorphosed to tactite. Numerous small lead-silver-gold-copper deposits occur in these zones. The geologic environments in these areas are considered potentially favorable for tungsten and disseminated gold-silver deposits and should be studied more thoroughly.

Mineral Area 4 - Bonham Canyon.

This area is defined on the basis of talc mineralization in Bonham Canyon. The two principal deposits in this area are at the White Mountain and Holiday mines, both of which are patented. Numerous smaller deposits occur on National Resource Lands in Bonham Canyon and in the area between Bonham and San Lucas Canyon.

Page (1951) described the White Mountain and Florence mines in Bonham Canyon. These and other deposits lie in a 3.5 km long belt in Hidden Valley dolomite bounded by two northwest-trending normal faults. The White Mountain mine produced 3,600 to 9,100

tonnes of steatite-grade talc from 1932 to 1942 (Page, 1951). The Florence mine produced about 900 to 2,700 tonnes of lower grade talc during those years (Page, 1951). Reserves at these mines are judged to be very large (Page, 1951).

The Holiday mine also contains reserves of talc of less than steatite quality. Talc occurs in lenses in "quartzite" mapped as Eureka Quartzite by Merriam (1963). Complex intertounguing relationships between the "quartzite" and the surrounding Hidden Valley dolomite noted by DPS geologists suggest the "quartzite" may be of hydrothermal origin rather than sedimentary. Several truckloads of talc have been shipped from the Holiday mine since October, 1976.

Mineral Area 5 - Cerro Gordo.

This area in the southwest corner of the planning unit has numerous deposits of silver, gold, lead, zinc, and copper. The principal mine is the Cerro Gordo mine (patented) which produced an estimated 4,400,000 ounces of silver, 33,600 tonnes of lead, and 10,900 tonnes of zinc carbonate ore (Merriam, 1963). Peak production was in 1874, and more than half the lead and three fourths of the silver were produced from 1869 to 1876. High-grade ores at Cerro Gordo have long been depleted, but there is still a potential that an economic low-grade deposit might be developed.

Other principal deposits in this mineral area are the Ella, Newtown, upper Newtown, and Lee #11. Cerrusite occurs abundantly at the Newtown and upper Newtown mines. Argentiferous galena and tetrahedrite are disseminated in quartz veins at the Ella and Lee #11 mines, and are locally concentrated in rich pockets. There is current activity at the Ella mine where the owners are using a dry concentrating device to rework the dump. The owners claim they are recovering $30.00 in silver per ton of ore. Numerous small lead-silver-copper deposits occur on or near the Cerro Gordo fault between San Lucas and Bonham Canyons. With the exception of Cerro Gordo itself, the deposits in the Cerro Gordo area are small, vein-type deposits. Small mining operations can be expected to continue in the years to come, but a large operation is not likely.

Mineral Area 6 - Nelson Range

McAllister (1956) mapped an intrusive contact between Hunter Mountain Quartz Monzonite and Pennsylvanian and Permian carbonate rocks (probably Keeler Canyon formation) that extends 13 km along the crest of the Nelson Range from Lee Flat to the floor of Saline Valley. Carbonate rocks along this contact are metamorphosed to tactite which is considered a potentially favorable host rock for tungsten mineralization. Commercial deposits of wollastonite may also occur in the area. Lead, silver, and copper deposits occur at the Cerrusite and Anton and Pobst mines.

Ore from the Cerrusite mine consisted of coarse-grained galena and cerrusite in quartz veins along small faults in quartz monzonite. The veins are explored by three adits. McAllister (1955) mapped and described the Cerrusite mine and reported that ore produced during the 1930's was worth $12 to $25 per ton in silver. However, samples analyzed by the U.S. Geological Survey indicated only about one percent lead, a few ounces of silver, and traces of gold and zinc.

A prospect believed to be the Anton and Pobst mine (McAllister, 1955) was visited by DPS geologists. An open cut about 15 metres across with walls three to four metres high exposes layers of wollastonite schist up to three metres thick. Chalcopyrite forms about 10 to 15 percent of the rock and is intergrown with wollastonite crystals. From field inspection, it appears that there is a considerable amount of copper left in this deposit. Several other small copper occurrences in this area were noted by McAllister (1955).

Mineral Area 7 - Saline Playa

This area contains both locatable and leaseable deposits, and is discussed in more detail in the section on leaseable commodities. Brines near the margins of the playa contain up to 2,000 ppm tungsten, 1,000 ppm molybdenum, and 0.1 percent lithium (Lombardi, 1963). Very high concentrations of lithium in playa clays were also noted by Lombardi (1963).

Mineral Area 8 - Dodd Spring

This area in the southeastern corner of the planning unit is underlain by a wedge-shaped pendant of Paleozoic sedimentary rocks surrounded by Hunter Mountain Quartz Monzonite. The pendant is partly bounded by a north-south trending normal fault which extends southward to Grapevine Canyon. This area was not visited by DPS geologists, but the geology and mineral deposits were mapped and described by McAllister (1955, 1956). Principal lead-silver-copper deposits are the Shirley Ann, Bonanza, and Navajo claims. Tungsten occurs at the Cuprotungstite and Monarch mines. The reader may refer to McAllister (1955) for descriptions of these deposits.

The Lippincott mine is located within Death Valley National Monument about ½ mile from the monument boundary. This mine produced about 2300 tonnes of ore averaging 30 percent lead from 1940 to 1955, yielding 380 tonnes of ore at that grade in 1954 alone. The large production and high grade of ore from this mine are worth noting, even though the mine is within Death Valley National Monument, because Section 6 of Public Law 94-429, which withdrew Death Valley from mining entry, provides for possible modification of park boundaries to exclude significant mineral deposits. The Lippincott mine may be a candidate for such exclusion.

B. Leaseable Resources

Leaseable resource in the Saline planning unit include sodium

and potassium salt deposits of the Saline Valley playa, and geothermal resources in the Lower Warm Springs area. In response to a request from BLM the U.S. Geological Survey Conservation Division conducted a geologic investigation of leaseable commodities in the area during December, 1976, and January and February, 1977. The study included sampling and analysis of water from seven hot springs, and core drilling at two sites at the southeast and northwest sides of Salt Lake. A formal report on the results of this study is included as Appendix V of this report.

Saline Deposits

Saline deposits in the area include chlorides and sulfates of sodium and potassium, and borates. Land was staked for borax in 1895 (Gale, 1914) and production of up to 90 percent borax from sediments was recorded a few years later (Baily, 1902). McAllister (1955) analyzed a sample of lake sediment from the southeast corner of the playa which yielded 1.45 percent B_2O_3. Small Crystals of ulexite were noted in this sample. McAllister believed a possible source of the borates was some Plio-pleistocene sediments that were deposited during a period of volcanism. A sample of this sediment contained 0.06 percent B_2O_3 (McAllister, 1955). Salt deposits in Saline Valley were discovered in 1864 (Hanks, 1884). Production was almost continuous from the turn of the century to 1930. In 1955, salt was being mined and stockpiled from the bed of Salt Lake, and a mill was planned in Keeler to process the salt.

Results of core drilling by the U.S.G.S. Conservation Division indicate the presence of salt layers to depths up to 258 feet at the south edge of the playa, confirming the presence of a large, potentially commercial salt deposit (Appendix V). The salt layers are chiefly sodium sulfate, with lesser amounts of chloride and minor borate and potassium salts. Brines, muds and salts encountered in the drill holes were analyzed, and gamma ray, resistivity, self potential, and caliper logs were conducted on two of the three holes. As a result of these studies, the U.S.G.S. has proposed a revision of the valuable for sodium and prospectively valuable for sodium boundaries (Map Sheet IV).

Geochemical studies of the playa brines and associated sediments were published by Lombardi (1963) and Hardie (1968). Lombardi chemically analyzed brine residues from 51 samples from boreholes in the playa (Table 1), and determined surface salt compositions from 21 of these borehole sites (Table 2) and lake mud compositions from eight sites (Table 3). Lombardi presented several maps that revealed a concentric zonal distribution of chemical elements in the brines.

Hardie (1968) published more chemical analyses of brines from the playa (Table 4) and of water from nearby springs (Table 5) in a paper that was concerned with chemical equilibria of the brines. Minerals which he noted in playa sediments include halite, thenardite, mirabilite, glauberite, gypsum, ulexite,

TABLE 1. COMPOSITION OF BRINE RESIDUES

Sample[a]	Substance, %											Substance, ppm						Salinity, %	pH	Depth to water, ft	Sediments
	Li	Na	K	Rb	Mg	Ca	Cl	Br	B	CO_3	SO_4	Cr	V	Cu	Mo	W	I[b]				
2[c]	0.03	36	2.0	0.03	1.0	1.0	50	0.25	0.12	0.8[d]	10.0	1	...	2	20	...	4	17	...	3	silt
3	0.02	36	3.5	0.06	0.01	0.01	42	0.07	0.15	6.0	10.0	2	10	2	100	...	5	20	9.6	4	sand
4	0.2	30	7.0	0.2	0.1	3.0	40	0.3	0.15	6.0	20.0	1	10	20	20	...	50	1.9	9.8	...	sand
5	0.01	29	3.0	0.5	3.0	0.1	21	0.02	0.05	...	45.0	1	1	20	800	300	...	28	7.6	3	gravel, sand
6	...	37	1.5	...	0.01	0.1	43	0.15	0.6	6.0	10.0	2	30	20	50	500	...	2.6	9.5	6	silt, clay
7	0.03	35	2.0	...	...	...	26	0.5	1.5	7.0	25.0	...	...	...	...	...	8	12	9.2	6	silt, clay
7'[e]	...	35	2.0	...	...	...	...	0.5	1.7	0.5	...	...	...	...	...	...	...	...	8.8	5	silt, clay
8	...	35	1.0	...	...	...	31	0.4	0.4	6.0	25.0	...	...	...	...	...	5	15	9.4	2	sand
9	0.03	35	3.5	0.05	0.01	0.01	49	0.05	...	...	8.0	2	1	20	2	100	8	12	...	1.5	sand
10	...	...	2.5	...	...	...	...	0.15	0.3	...	5.0	...	...	...	...	...	...	20	...	...	sand
11	0.4	34	2.5	0.02	0.1	0.01	45	0.15	0.25	6.0	8.0	1	1	20	2	...	10	1.6	...	2	sand
12	0.02	36	3.5	0.04	0.1	0.01	50	0.15	...	...	8.0	1	1	10	3	100	3	29	...	0	silt
13	0.01	35	2.5	0.03	0.01	0.01	42	0.03	...	...	15.0	...	...	3	...	...	2	18	...	0	silt
14	0.01	37	2.5	0.03	0.1	0.01	48	0.04	...	...	10.0	1	1	200	1	...	7	10	...	0	silt
15[f]	0.02	35	5.0	0.04	0.01	0.01	51	0.04	...	...	7.0	1	3	5	3	...	3	18	...	0	sand
16	0.01	37	3.5	0.2	0.03	0.003	47	0.2	...	...	...	2	...	1	3	...	20	2.1	...	2.5	sand
17	0.01	32	2.0	0.3	0.3	3.0	45	0.3	...	...	15.0	5	10	2	3	...	30	1.2	...	2.5	sand
18[g]	0.01	33	3.5	0.2	0.3	0.3	46	0.2	...	...	7.0	2	10	5	...	...	50	1.8	...	3	sand
19	...	33	2.0	0.5	3.0	0.1	48	0.2	...	...	15.0	1	1	3	50	500	...	28	...	5	sand
21	...	...	3.0	...	...	...	...	...	...	...	7.0	...	...	...	...	...	...	9	...	...	...
21'	...	...	2.0	...	1.0	1.0	...	0.2	0.3	...	5.0	...	40	1	...	...	...	30	7.0	0	silt, clay
22	0.01	36	1.5	0.08	0.1	0.1	48	0.5	0.08	0.4[h]	0.1	10	3	1	1	200	0.4	32	...	5	silt
23	0.02	36	1.0	0.005	0.01	0.01	45	0.4	0.15	0.6[h]	15.0	1	3	10	10	...	180	30	...	5	silt
24	...	35	2.5	...	...	...	45	0.25	0.25	0.4[h]	15.0	...	...	...	...	...	6	30	...	1.5	sand
26	0.05	31	3.0	0.04	0.01	0.3	31	0.6	2.0	...	20.0	...	3	0.3	2	...	10	30	...	2	sand
27	0.3	35	2.5	0.02	0.1	0.1	41	0.15	0.7	4.0	15.0	10	3	40	...	...	30	1.2	...	3	sand
28	...	34	1.5	...	0.2	0.01	~51	0.2	...	...	...	2	5	400	20	300	...	3.0	7.0	0	calcareous ooze
29	0.002	36	1.0	0.03	0.1	0.1	~55	0.3	...	...	7.0	1	3	15	...	...	...	36	7.1	0.1	calcareous ooze, NaCl
30[i]	...	36.5	1.3	...	0.23	0.08	50.2	...	1.7	0.29[d]	8.1	...	...	...	...	...	...	30.7	7.6	0	calcareous ooze
31[j]	...	35	1.1	...	0.16	0.07	49	...	1.6	0.26[d]	8.6	...	...	...	...	...	...	31.5	7.6	0	calcareous ooze, NaCl
32	0.003	36	2.5	0.04	0.3	0.03	52	0.3	...	...	8.0	5	1	5	...	...	...	26	...	0.2	calcareous ooze, NaCl, clay
33[k]	...	36.7	1.2	...	0.15	0.09	51.5	...	1.6	0.21[d]	5.5	...	...	...	...	...	...	29.9	7.5	0.1	calcareous ooze, NaCl, clay, sulfides
34	0.02	36	1.5	0.03	1.0	0.03	54	0.3	0.3	...	6.0	1	1	3	1	...	2	33	...	0.2	calcareous ooze, NaCl, clay
35	0.003	32	2.0	0.04	0.1	0.01	44	0.25	0.15	...	9.0	1	1	10	1	30	2	31	...	0.5	clay
36	0.02	37	1.0	0.02	0.1	0.3	52	0.3	0.15	...	7.0	2	3	3	10	...	<1	27	...	0	calcareous ooze, clay, silt
37	0.004	38	0.7	0.04	0.1	0.01	55	0.3	...	...	5.0	1	1	4	1	...	10	31	...	0.2	calcareous ooze, silt
38	0.03	...	0.3	...	0.01	0.3	...	0.02	...	...	10.0[l]	...	5	0.3	2	...	5	1.8	...	3	calcareous ooze, silt
39	0.004	...	0.2	0.07	2.0	10.0	...	...	...	...	7.0	3	10	1	10	...	40	4.6	...	4	silt, clay
40	0.02	37	1.0	0.06	0.01	0.03	53	0.25	0.1	...	7.0	1	3	2	10	...	<1	29	...	5	silt, clay
41	0.02	37	0.3	0.01	0.3	0.1	52	0.25	0.1	...	9.0	1	1	3	2	...	<1	25	...	0	calcareous ooze
42	0.02	34	6.0	0.01	0.01	0.01	50	0.25	0.15	...	...	...	1	3	1	...	<1	28	...	3	calcareous ooze, silt
43[m]	0.001	...	...	...	10.0	10.0	...	0.5	...	...	10.0	10	400	10	50	2,000	...	0.7	...	4	sand
45	0.02	36	2.0	0.03	0.01	0.03	46	0.3	0.2	0.2	15.0	1	1	5	10	...	6	25	...	3.5	silt
46	0.006	...	0.8	...	1.0	10.0	...	0.2	...	...	9.0[l]	5	50	10	50	1,000	3	3.3	...	4	sand
47	0.007	...	2.0	...	3.0	10.0	...	0.5	...	...	15.0[l]	5	40	1	20	2,000	30	1.5	...	4	sand
48[n]	...	28.6	11.5	...	0.08	0.38	20.7	...	2.8	0.6	32.0	...	...	...	...	...	...	0.42	8.5	5	silt, clay
49	...	34	3.0	0.1	0.3	3.0	50	0.06	...	...	10.0	2	3	20	30	400	...	4.4	...	2.5	silt, clay
50[o]	...	29.5	6.0	...	0.04	0.05	13.5	...	1.3	7.1[p]	37.0	...	...	...	...	...	...	0.68	...	6	silt, clay
51[q]	...	36.2	1.0	...	0.30	0.60	53.0	...	0.1	...	8.2	...	...	...	...	...	...	6.34	7.8	5	silt, clay
52[r]	...	31.8	0.58	...	0.44	0.88	70.9	...	0.5	14.3	26.6	...	...	...	...	...	...	0.225	8.3	8	sand
53[s]	...	29.3	...	...	0.32	3.2	9.7	...	0.5	24.7+	20.6	...	...	...	...	...	...	0.669	8.4	10	silt

[a] All samples contain about 1 ppm chromium.
[b] Iodine present as IO_3^-, except in samples 7, 8, 11, 12, 24, 27, 34, 35, 36, and 41 where it is present as I^-.
[c] Contains 1 ppm silver.
[d] Largely HCO_3^-.
[e] Sample 7' was green in color, because of the presence of algae. The sample was taken very near sample 7 (within 500 feet), in an open pool of water at the bottom of a sinkhole.
[f] Contains 15 ppm lead.
[g] Contains 10 ppm lead.
[h] Also present as HCO_3^-.
[i] Contains 0.011% SiO_3 and 1.3 ppm PO_4.
[j] Contains 0.011% SiO_3 and 2.0 ppm PO_4.
[k] Contains 0.0023% SiO_3 and 1.8 ppm PO_4.
[l] Data questionable.
[m] By spectrographic determination, 200 ppm tellurium, 30 ppm nickel, and 10 ppm chromium present.
[n] Contains 0.76% SiO_3.
[o] Contains 0.43% SiO_3 and 0.2% fluorine.
[p] About 75% HCO_3^-.
[q] Contains 0.08% SiO_3 and 0.04% fluorine.
[r] Contains 4.3% SiO_3 and 0.18% fluorine.
[s] Contains 12.2% SiO_3 and 0.32% fluorine.

TABLE 2 COMPOSITION OF SURFACE SALTS

Sample	Substance, %								Substance, ppm				pH of solution
	Li	K	Rb	Mg	Ca	Br	SO_4	Pb	V	Mo	Ag	I[a]	
3	......	0.1	......	......	......	0.02	......	....	......	....	....	10	......
4	0.001	4	0.03	0.01	0.01	0.001	......	....	30	20	....	10	......
5[b]	......	0.2	......	0.3	0.1	0.007	66	....	......	20	....	500	8.5
7	......	0.2	......	0.01	0.1	......	2	....	......	....	1	......	9
8	......	1	......	0.01	0.1	0.02	......	....	10	....	....	1	......
10	0.003	1	......	1	3	0.05	3	....	10	1	....	2	9.5
11	0.01	2	0.02	0.001	0.01	0.2	......	....	3	....	....	10	......
13	......	0.1	......	0.001	0.01	0.01	......	....	......	....	....	......	......
15[c]	0.002	0.2	0.02	0.01	0.01	......	......	3	30	....	....	......	......
16	......	2	......	0.1	0.1	0.1	......	....	......	10	....	......	......
21	......	0.1	......	0.01	0.1	......	2	....	30	3	3	......	8.5
21	......	......	......	1	1	......	......	3	300	1	10	......	......
22	......	0.2	......	0.001	0.1	......	1	....	......	....	10	......	9
23	......	0.1	......	0.001	0.01	......	0.7	....	10	3	....	......	8.5
25	......	0.5	......	0.001	0.01	......	......	2	10	....	1	......	......
26	0.005	1	......	0.001	0.1	0.1	8	....	......	....	....	3	8.7
27	......	1	......	......	......	0.3	......	....	......	....	....	1	......
32[d]	......	0.5	......	1	1	......	......	....	......	2	....	......	......
36[d]	......	......	......	0.1	1	......	......	....	3	5	....	......	......
41	0.002	......	......	0.1	1	......	......	30	3	2	....	......	......
42	......	......	......	0.01	0.1	......	......	....	......	2	....	......	......

[a] Iodine present as IO_3^-.
[b] Sample contains 98% Na_2SO_4 (thenardite).
[c] Contains 20 ppm copper.
[d] Contains 5 ppm copper.

TABLE 3 COMPOSITION OF SALINE VALLEY LAKE MUDS

Sample	Substance, %										Substance, ppm					
	Li	K	Rb[a]	Mg	Ca	$CaSO_4$	CO_3 (Ca, Mg)	Clay	Silt	Brine	Cu	V	Cr	Mo	W	Pb
7	50	2	0.4	3	3	1	20	40	10	30	50	10	80	2	400	......
19	......	0.2	.4	1	10	20	20	5	5	40	20	....	3	3	500	......
20	50	2	.4	3	3	2	10	60	10	20	50	10	100	3	300	......
21	50	2	.4	3	3	2	20	40	10	30	50	5	80	4	400	......
22	50	2	.4	3	3	1	20	50	10	20	50	10	80	4	400	......
23	50	2	.4	3	3	1	15	5	60	20	50	10	80	....	400	......
25	100	2	.4	3	3	1	20	50	10	20	50	20	100	1	......	600
28[b]	20	2	0.4	10	10	....	40	10	5	50	40	10	100	10	......	400

[a] Rubidium values uncertain.
[b] Also contains 20 ppm silver.

Table 4 Chemical analyses of brines from Saline Valley, California* (concentrations in ppm)

Sample No.	Date collected	Depth to brine (in.)	Water temp (°C)	SiO_2	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	Br	B	Dissolved solids (calculated)	pH	Coexisting saline minerals†
SL2	2-9-64	16	12	23	776	380	24,800	334	175	0	12,100	33,200	89	50	71,840	7·95	G
SL3	1-22-63	0		74	538	438	101,000	1610	534	0	8410	155,000	142	156	267,630	7·5	H
RBR562‡	5-27-57	0	38	74	458	363	102,000	1220	504	0	12,300	154,000	126	—	271,000	7·3	(?)
SL4	1-22-63	30	14	41	809	105	11,900	127	118	0	7050	16,000	57	21	36,170	7·80	G
SL5	1-22-63	36	14	48	410	618	101,000	1720	607	0	13,700	152,000	504	328	270,640	7·35	GL
SL5W§	2-1-64	6	12	3·9	634	322	61,800	789	389	0	18,500	83,500	240	52	166,030	7·85	(?)
SL7	2-9-64	15	11	24	944	382	25,900	233	134	0	9910	37,600	103	49	75,210	7·8	G
SL8	2-8-64	48	14	1·5	149	199	102,000	3060	603	0	15,600	147,000	247	196	268,750	7·0	GL
SL13	1-25-63	42	13	36	286	552	103,000	4830	614	0	22,900	150,000	429	15	282,360	7·35	GL + H
SL16	2-2-64	30	10	1·8	477	1670	33,000	4560	211	136	39,200	31,500	22	27	110,700	8·2	M + GL
SL18-5	2-8-64	60	14	8·8	8·5		83,800	5310	0	5770	29,800	108,000	135	287	233,160	9·1	none
SL22	2-1-64	54	14	1·2	0	8·5	65,700	3140	0	2190	22,100	81,900	184	357	178,590	8·85	none
SL23	1-23-63	36	13	4·1	tr.	tr.	103,000	5190	6200	0	31,400	144,000	238	701	287,630	8·25	M + H
SL24	1-23-63	36	13	39	102	25	104,000	4890	1340	0	26,800	147,000	408	276	284,330	8·0	GL + H
SL24-1	2-1-64	36	14	5·1	107	39	103,000	4150	1380	0	16,900	150,000	185	299	275,370	7 95	GL + H
SL26	2-2-64	60	14	13	603	169	29,700	818	20	96	8180	41,800	73	59	81,530	7·9	G
SL29‖	Jan. 63	0		43	102	137	100,000	8400	7700	0	8230	155,000	577	530	276,870	8·35	M + H
SL29-2	2-1-64	0	20	8·8	36	13	51,200	2870	91	1250	19,800	67,700	215	182	143,340	8·55	M
SL29-3	2-1-64	0	20	14	9·4	3·5	28,800	1650	1510	1300	10,100	37,400	142	90	80,270	8·55	Calcite
SL33	2-2-64	36	14	15	232	161	16,400	474	386	0	7940	21,200	38	64	46,720	8·2	G
SL38	2-7-64	60	14	20	352	134	9430	914	156	0	5590	12,300	9	2·2	28,840	7·75	G
SL39	2-7-64	48	14	9	416	999	25,100	2360	159	0	7860	37,700	20	6·9	74,550	7·6	G
SL39-1¶	2-7-64	0		15	378	1210	23,900	2960	160	0	7390	38,900	14	8·1	74,870	7·65	(?)
SL48	2-9-64	60	14	62	534	108	4900	39	99	0	3370	5940	28	13	15,100	7·6	G
SL50	2-9-64	48	14	54	692	107	4500	57	123	0	3900	5600	23	10	14,850	7·5	G
2**		36			1709	1700	61,200	3400		1360††	17,000	85,000	425	204	170,000‡‡		G§§
4		—			570	19	5700	1330		1140	3800	7600	67	28	19,000	9·8	G
5		36			280	8400	81,200	8400			126,000	58,800	56	140	280,000	7·6	M + GL
6		72			26	3	9620	390		1560	2600	11,180	39	156	26,000	9·5	G
19		60			280	8400	92,400	5600			42,000	134,400	560		280,000		GL
27		36			12	12	4200	300		480	1800	4920	18	84	12,000		G
40		60			87	29	107,300	2900			20,300	153,700	725	290	290,000		GL
45		42			75	25	90,000	5000		500	37,500	115,000	750	500	250,000		G
48		60			16	3	1201	483		25	1344	869		117	4200	8·5	G
49		30			1320	132	14,960	1320			4400	22,000	26		44,000		G
51		60			380	190	22,951	634			5199	33 602		63	63,400	7·8	G

* Shirley L. Rettig, Analyst, except where noted.

† G = gypsum; GL = glauberite; H = halite; M = mirabilite.

‡ Collected by R. C. Scott, U.S.G.S., from the "salt lake", presumably in the area of borehole 3. Analysis courtesy Blair F. Jones.

§ Collected from shallow hole dug in dry wash bed about 150 ft due east of borehole 5.

‖ Collected 300 ft downstream from brine spring orifice in distributary bed. SL 29-3 collected at orifice and SL 29-2 between SL 29 and SL 29-3

¶ Surface brine in distributary bed immediately east of borehole 39.

** This, and all the analyses listed below it, are recalculated from Lombardi (1963, Table 1). The numbers are those of Lombardi. The locations of the sampling points are shown in Fig. 8.

†† Lombardi reports all carbonate species as CO_3^{2-} in all his analyses.

‡‡ Lombardi reported all his brines in terms of % salinity.

§§ The co-existing minerals listed for Lombardi's brines are those *predicted* by the present author on the basis of the location of each brine within the mineralogic zones of the present study.

Table 5 Chemical analyses of spring and stream waters from Saline Valley, California (concentrations in ppm)

Sample location	Date collected	Water temp. (°C)	SiO_2	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	Mole ratio HCO_3/Ca	Dissolved solids (calculated)	pH
Palm Spring	1-15-63	43	50	46	17	208	22	360	0	250	68	5·25	848	8·1
	10-11-53*	41	43	61	20	194	21	375	0	260	71	4·04	859	7·9
	†			86	5	190	24	370	19	190	65	2·83	1000§	8·0
Lower Warm Springs	1-15-63	43	51	48	17	212	22	376	0	254	68	5·13	863	8·1
	10-11-53*	41	43	63	20	193	19	417	0	218	69	4·35	841	7·5
	5-27-57‡	43	45	66	20	209	20	432	0	243	66	4·29	880	7·4
	†			51	22	231	22	368	9	210	67	4·75	1050	7·9
Artesian Well	1-21-63		30	34	22	80	8·1	141	0	193	36	2·72	480	7·5
	†			10	35	128	7·0	128	0	186	42	8·40	580	8·1
Mine Camp Spring	1-31-64	22	28	90	35	21	4·9	144	6	264	11	1·05	525	8·4
	5-27-57‡	27	29	88	34	23	5·1	153	1·4	263	10	1·14	529	8·3
	†			84	35	48	2·3	120	12	240	21	0·94	600	8·1
Hunter Canyon	1-31-64	10	33	72	8·9	12	2·5	122	2	122	11	1·11	323	8·3
	†			72	9	28	2·5	112	11	112	7	1·02	400	8·3
Beveridge Canyon	2-1-64	10	36	83	10	15	3·7	128	0	153	14	1·01	378	7·6
McElvoy Canyon	†			61	16	36	2·9	138	9	102	14	1·49	510	8·2
Willow Creek	†			46	24	137	9·4	209	11	173	60	2·98	720	8·3
Badwater	†			126	61	240	7·5	345	4·5	459	150	1·80	1500	7·4
Jackass Spring	†			78	18	42	5	330	16	14	15	2·77	560	7·5
Grapevine Canyon	†			87	17	62	6	322	15	20	39	2·43	620	
	†			95	20	95	11	270	11	124	60	1·86	730	7·0
	†			84	30	91	9	281	14	99	97	2·19	760	7·7
	†			30	22	46	3	152	0	42	39	3·32	380	7·2
Freshwater Pond	†			162	113	1074	32	216	11	1080	2106	0·88	5400	8·3
Upper Springs	†			51	27	210	20	350	13	210	65	4·51	1000	7·5
Many Springs	†			32	36	227	27	346	27	248	55	7·09	1080	8·1

* Collected by Siegfried Nuessig, U.S.G.S. Analyses courtesy Donald White, U.S.G.S.
† Analyses recalculated from Lombardi (1963, Table 2).
‡ Collected by R. C. Scott, U.S.G.S. Analyses courtesy Blair F. Jones, U.S.G.S.
§ This, and all other analyses of Lombardi (1963, Table 2), were reported as % salinity.

calcite, dolomite, analcime, and sepiolite. These minerals occur in a zonal distribution that is concentric with the margins of the playa (Fig. 8). From the brine compositions, mineralogy, and zonation, Hardie postulated an equilibrium model for the evolution of the brines that was controlled by the bulk composition of the parent water and the extent of evaporation. Hardie predicted the continued outward migration of the mineral zones and the addition of a new central glauberite-halite-thenardite zone in the future.

Geothermal Resources

The Saline Valley KGRA was defined in 1975 by the U.S. Geological Survey Conservation Division on the basis of overlapping lease applications only (Map Sheet V). Very little data from hot and warm springs exist, but analyses of water samples from seven springs are included in the U.S.G.S. report (Appendix V). Lombardi (1963) reports water temperatures of 43 degrees C. at Burro Spring and 49 degrees C. at Palm Spring. Temperatures of 55 to 65 degrees C. are recorded in the Saline Valley KGRA minutes (Appendix V).

C. Saleable Commodities

DPS geologists did no field work that dealt with saleable commodities specifically. DPS soil scientists classified and mapped soil types in the Saline Planning Unit, and suitability for sand and gravel was one criterion for classification. This information will be included in a soil report that is currently being prepared.

Saleable clay deposits might occur in playa deposits in the area.

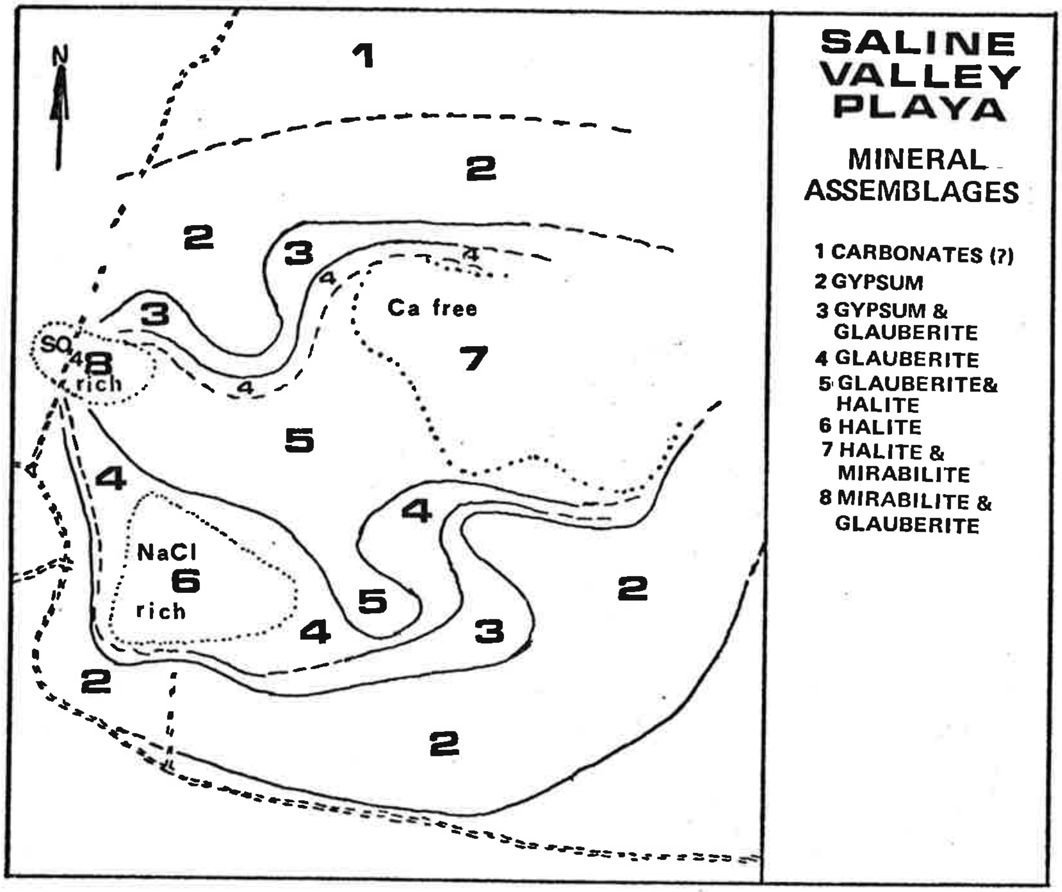


FIGURE 8: SALINE VALLEY PLAYA SHOWING ZONAL DISTRIBUTION OF MINERALS WITHIN THE UPPER FIVE METRES OF PLAYA SEDIMENTS BELOW THE EFFLORESCENT CRUST. (MODIFIED FROM HARDIE, 1968)

Cinders occur in the older volcanic sequence in the Saline Range. Most of the rock in the planning unit breaks up into small fragments, some of which might be suitable for rock fill. Limestones of the Lost Burro formation in the southern Inyo Mountains might be suitable as a dimension stone or as terrazzo.

IV. OPPORTUNITIES

In this section, the major findings of the DPS field survey of the Inyo Mountains portion of the Saline Planning Unit are summarized, and recommendations for further investigations are set forth. It must be stressed that only part of the planning unit was examined by DPS geologists in the field, and that no geophysical studies were conducted. The results given here are only preliminary, and are not an adequate basis for land use decisions. It is recommended that no areas be withdrawn from mining entry without a detailed minerals inventory.

Talc Resources. Talc is and will continue to be a very important mineral resource in the Saline Planning Unit. As the demand for talc for wall tile and electronic components increased between 1933 and 1943, talc production in California increased to 60,000 tonnes per year. Much of this production came from mines in the Inyo Mountains. During those years, steatite grade talc was necessary in the manufacture of high frequency electrical insulators, and was classified a critical mineral during several months of the war years 1942 and 1943. Mines in Bonham Canyon and the Willow Creek area were among the few suppliers of steatite-grade talc (Page, 1951).

In the post-war years, increasing demand for talc for wall tile and paint resulted in increased talc production. Annual production in California reached 110,000 tonnes in 1951, and has been in the range of 140,000 to 168,000 tonnes since 1970 (Evans, 1976). Mining shifted

to larger deposits in Death Valley National Monument during this time. Over 90 percent of the talc produced in California in 1975 came from a few mines in Death Valley (Evans, 1976).

On September 28, 1976, Congress enacted Public Law 94-429 which restricted mining entry and limited development of existing mines in six national parks and monuments including Death Valley. This law will greatly reduce or terminate talc production in Death Valley, and force producers to look elsewhere for talc to meet the high demand. Johns-Manville Products Corporation, the largest talc producer in Death Valley, has already closed its mines. Almost immediately after P.L. 94-429 was enacted, there was renewed activity at the White Eagle and Holiday Mines in Saline Valley. Talc is now being shipped regularly from both mines. Exploration and production will probably continue to increase in Saline Valley in the near future.

Saline Valley Playa Deposits. Both locatable and leaseable commodities occur in the Saline Valley Playa, presenting a potential mineral management problem. Drilling by the U.S. Geological Survey confirmed that a large potentially-commercial salt deposit does exist on the playa, and that it extends down to depths greater than 250 feet.(Appendix V). Borax occurs in locally high concentrations but in limited amounts on the playa. The recent closing of Tenneco's large borax mines in Death Valley due to P.L. 94-429 might stimulate some renewed prospecting for borax in Saline Valley. Potentially commercial deposits of tungsten, molybdenum, and lithium also occur in playa brines and clays.

Lombardi (1963) summarized the economic potential of the playa as follows:

> "In prospecting for such metals as copper, lead, molybdenum, and tungsten, important guiding clues may be obtained from comprehensive analyses of brines along the margins of saline lakes.
>
> "The comparatively high concentrations of tungsten in Saline Valley brines suggest that terrestrial brines may become an important source of tungsten. The lower limit of mined tungsten ores in the United States (1953) is 0.25% tungstic oxide, which compares favorably with some tungsten concentrations on the margins of the Saline Valley playa; however, at present, there are serious problems that prevent the commercial extraction of tungsten from brine.
>
> "The locally high concentrations of borax and sodium carbonate are not of commercial importance because of lack of quantity. Borax has not been mined in Saline Valley since borax dropped from above $300 per ton in price.
>
> "Thenardite (anhydrous sodium sulfate) is present in commercial amounts, but would need some cleaning before being marketable. There appears to be between 400,000 and 1,000,000 tons of thenardite on the playa.
>
> "More prospecting for iodine should be done, as commercial deposits of iodine in the salt crust as well as in the brine appear to be probable."

Geothermal Resources. Little is known about the geothermal resources in Saline Valley. The U.S. Geological Survey Water Resources Division sampled and analyzed water from seven hot springs in the area. Results of these analyses are included in Appendix V. Even these data might be insufficient as a basis for granting drilling permits. Additional data, obtained through geophysical surveys (seismic, magnetometer, resistivity, and gravity) and by drilling one or more test holes to measure water temperatures and flow, temperature gradients and head flow, would be useful in managing geothermal resources.

Locatable Metallic Commodities. Most of the known deposits of metallic commodities in the Saline Planning Unit occur in small lode-type deposits. These deposits will probably continue to support small intermittent mining operations, but are too small to develop a large operation under current economic conditions. In the more distant future, however, these deposits may become economic as world reserves are depleted and prices increase.

Broad silicified zones in carbonate rocks surrounding quartz monzonite stocks in the upper parts of Craig and Hunter Canyons are favorable environments for a possible disseminated gold-silver deposit. Geochemical and geophysical (magnetometer and gamma-ray spectrometer) surveys would provide additional data which might indicate if such a deposit exists.

Numerous areas underlain by tactite were noted by DPS geologists, notably in the Nelson Range and south of New York Butte. Tactite is generally considered a favorable host rock for tungsten mineralization. There has been little prospecting for tungsten in these areas, but these areas should nevertheless by kept open for mineral exploration.

V. REFERENCES CITED.

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APPENDIX I, TABLE 1

INVENTORIED MINERAL OCCURRENCES

APPENDIX 1, TABLE 1. DPS – INVENTORIED MINERAL OCCURRENCES, SALINE PLANNING UNIT
(Commodities in parentheses either reported but not found or inferred)

MINERAL AREA	LOC. NO. MAP 3	LOCATION SEC.	TWP. (S)	RNG. (E)	NAME	COMMODITIES & MINERALS	GEOLOGY & MINE WORKINGS	PRODUCTION, GRADE, RESERVES	FIELD SURVEY DATE	BY	NOTES	OWNER	REFERENCES
I	1	2	11	37	Morning Star	Au(?)--pyrite	Series of east-west quartz veins in Campito Fm. Several shallow pits and 2 adits		1/26/77	CPS	0331	George Hill, Herman Floyd, Sam Blair, Assess. work 1973.	Nelson (1971)
I	2	21	11	37	Waucoba Tungsten	W-scheelite; Cu-chrysocholla jasper	Scheelite in parallel bands in argillite. Inclined shaft, 220 m total workings	1939-42, millheads avg. 1-2% WO_3. Production small.	1/21/77	RDK	0409		Norman and Stewart (1951 Ross (1967)
I	3	5	12	37	Bunker Hill (Lucky Josephine)	Pb-Galena, Cerrusite; (Au, Ag)	Oxidized sulfide replacement bodies in Poleta Ls. Highly fractured, overturned. Extensive workings on at least 3 levels	Less than 100,000 pounds Pb.	1/22/77	RDK	0412	A.L. Lawrence, Verdi, Nevada. 11/19/74.	Goodwin (1957 Norman & Stewart (1951), Ross (1967)
I	4	17	12	37	Blue Monster (Monster)	Pb-Galena (Au, Cu, Ag)	Quartz veins & stringers, irregular galena lenses in brecciated Bonanza King Ls	1908-21: More than 100,000 pounds Pb, 9,000 pounds Cu. 1935: 50 tons ore at $100 per ton.	1/23/77	RDK	0415		Ibid
I	5	19	12	37	Lucky Boy	Pb-Galena; (Ag, Au, Cu)	Veins in Tamarack Canyon Dolomite. Numerous workings	Small production.	1/23/77	RDK	0419		Ross (1967)
II	6	11	13	37	Grey Eagle (Eleanor, Rogers)	Talc	Talc pods in coarsely-crystalline Ls. & dolomite associated with silica rock. Open pit & several adits.	Est. 25,000 tons of rock removed. Est. large reserves.	1/20/77	RDK	0408		Norman and Stewart (1951 Page (1951)
II	7	14	13	37	Doris D. (Bradley)	Talc, (magnesite)	Talc pods in coarsely-crystalline Ls. & dolomite. No silica rock.	Est. 10,000-15,000 tons of rock removed. Est. large reserves.	1/20/77	RDK	0408	Sierra Talc & Clay Co., Los Angeles. 1951	Norman and Stewart (1951 Ross (1967)

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II	8	18	14	38	Snowflake (Hilderman)	Talc	Two bodies light gray talc each about 100 m x 20 m 17 in marble near contact with quartz monzonite. Two open pits and millsite.	Some production. Now inactive. Appears to be high quality talc.	1/19/77	CPS	0326	Alan Akin, Dan Dickman, Fred Story-Saline Valley, Calif.	Norman and Stewart (1951)
III	9	15	14	37	Keystone (Keynot)	(Au); Cu-chalcopyrite, Azurite, malachite--pyrite.	Two NW-trending quartz veins (Confidence & War Eagle) each 1-2 m thick in quartz monzonite. Explored by adits, more than 60 m drifts	Total reported production $500,000 at rate of $10,000 per month in 1870's & 80's. Est. about $1,000,000 in gold on dump at present prices.	10/25/76	CPS	0180	F & B Coman (1967)	Flint (1941), Norman and Stewart (1951)
III	10	SE, SW 15	14	37		Cu-malachite; (Au)--pyrite.	NE-trending quartz vein in quartz monzonite. Inclined shaft more than 60 m deep.		10/28/76	CPS	0185		Flint (1941)
III	11	SE, SW 15	14	37		(Au)--pyrite, limonite.	Quartz vein about 2 m thick in quartz monzonite. Abundant cellular limonite & pyrite pseudomorphs. Wall-rock altered to sericite and epidote.		10/28/76	CPS	0185	Independence Mining Co. Independence, CA (1930's)	Ibid.
III	12	SE 15	14	37	Tom Hancock	(Au)--pyrite.	50 cm thick quartz vein in quartz monzonite. Scattered small pyrite crystals. Prospect. SE extension Confidence Vein		10/28/76	CPS	0184	F. & B. Coman	Ibid.
III	13	NE NE 22	14	37	Mallard Duck	(Au)--pyrite, limonite.	Limonitic quartz vein with well-formed pyrite crystals in quartz monzonite. Extension of War Eagle Vein. Caved adit.		10/28/76	CPS	0183	F. & B. Coman (1969)	Ibid.

APPENDIX 1, TABLE 1. DPS — INVENTORIED MINERAL OCCURRENCES, SALINE PLANNING UNIT
(Commodities in parentheses either reported but not found or inferred)

MINERAL AREA	LOC. NO. MAP 3	LOCATION SEC.	TWP. (S)	RNG. (E)	NAME	COMMODITIES & MINERALS	GEOLOGY & MINE WORKINGS	PRODUCTION, GRADE, RESERVES	FIELD SURVEY DATE	BY	NOTES	OWNER	REFERENCES
III	14	NE, NW 26	14	37		Cu-chalcopyrite malachite; (Au) --pyrite.	30-60 cm thick quartz vein in shear zone in quartz monzonite. Inclined adit.		10/29/76	CPS	0188		Flint (1941)
III	15	SE, NW 26	14	37		Cu-chalcopyrite malachite; (Au)	7-15 cm thick quartz vein in shear zone in quartz monzonite. Inclined adit 10 m long, 5 m crosscut.		10/29/76	CPS	0187		Ibid.
III	16	SW NW 26	14	37	Green Bear	(Au)--pyrite	2-4 m wide quartz vein in quartz monzonite. 18 m adit		10/29/76	CPS	0186		Ibid.
III	17	NE NE 35	14	37		Cu-chalcopyrite malachite;-- limonite	Limonitic quartz vein in argillized quartz monzonite. Numerous prospects over distance of 100 m		10/25/76	D.M.	0205		
III	18	NE, NE 35	14	37		Cu-chalcopyrite malachite, chrysocholla, chalocite	Quartz vein in quartz monzonite.		10/25/76	D.M.	0206		
III	19	36	14	37	Big Horn	Cu-chalcopyrite, azurite, malachite; (Au, Ag, Pb)	Quartz veins in quartz monzonite. Inclined shaft and 2 adits, drifts at 3 levels.	"Moderate" tonnage produced intermittently 1918-1939 averaging 20% Pb, 3.48 oz. Ag, .185 oz. Au, some Cu.	10/25/76	D.M.	0206		Goodwin (1957), Norman & Stewart (1951)
III	20	NW, NW 6	15	38	Loadstar	Fe-Pyrrhotite	Lenticular vein massive pyrrhotite in sheared quartz monzonite.		10/30/76	D.M.	0210	Son-Zid Metals (5/20/68)	

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MINERAL AREA	LOC. NO. MAP 3	LOCATION SEC.	TWP. (S)	RNG. (E)	NAME	COMMODITIES & MINERALS	GEOLOGY & MINE WORKINGS	PRODUCTION, GRADE, RESERVES	FIELD SURVEY DATE	BY	NOTES	OWNER	REFERENCES
III	21	NW, NW 3	15	38	Metro(Big Silver)	Pb-Galena; Cu-malachite, chalcocite; (Ag-Argentite, Native Silver); (Au)--pyrite	Two adits & shaft on quartz veins at contact quartz monzonite and limestone. More than 200 m drifts and several stopes.	Some Ag, Pb, Cu, Au production 1928 assaying ~~30~~ oz. Ag, 2-9% Pb.	1/18/77	CPS	0323	Fred Storey; Saline Valley, California	Goodwin (1957) Norman and Stewart (1951)
III	22	SE, SE 8	15	38		(Ag-Cerargyrite)--limonite	Three east-west trending quartz veins in kaolinized quartz monzonite. No workings.		10/30/76	CPS	0189		
III	23	SW, SW 9	15	38	Trepier	Cu-chalcopyrite, tenorite, covellite, malachite	Discontinuous quartz veins & stringers in quartz monzonite. Two adits: 1. 30 m 4 stopes, 3 winzes; 2. 15 m 1 open stope.		10/30/76	CPS	0189		
III	24	NE, SW 9	15	38		Cu-chalcopyrite, tenorite, covellite, malachite	Quartz Veins in 3 m wide zone in quartz monzonite. Caved adit.		10/30/76	CPS	0191		
III	25	SE, SW 11	15	37		(Au)--limonite	30cm thick quartz vein in quartz monzonite of New York Butte. Inclined shaft 6 m.		10/7/76	CPS	0174		Merriam (1963)
III	26	11, 14	15	37		Cu-chrysocholla, malachite	Recrystallized Triassic limestone & tactite. Cu in 1-3mm seams. Two adits.		10/7/76	CPS	0173		Merriam(1963)
III	27	14	15	37		Pyrite, limonite, garnet, epidote (possible tungsten)	Broad alteration halo south of New York Butte stock with silicified, kaolinized & tactite zones in Triassic limestone. Some quartz veins. Six prospects and one shaft.		10/7/76	CPS	0170		Merriam(1963)

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III	28	14	15	37	Burgess (Ironside)	(Au); Pb-galena--limonite	Several shafts, adits and prospects in silicified Triassic limestone. Several NW trending shears and aplite dikes.	Some production. Ore assayed $20-40 per ton in Au.	10/6/76	CPS DM	0167		Merriam(1963) Norman and Stewart(1951)
IV	29	2	16	38	White Mountain	Talc	NW trending talc zone in Hidden Valley Dolomite bounded by two faults. Central andesite dike. Several caved adits, open pit.	4,000-10,000 tons steatite grade talc 1932-42. Estimate large reserves.	10/27/76	CPS	0182	Sierra Talc Co (1952) Patented.	Merriam(1963) Norman and Stewart(1951) Page (1951)
IV	30	NE, NE 2	16	38	Doug #1	Pb-galena, cerrusite Cu-chrysocholla Zn-sphalerite--pyrite, goethite.	Oxidized veins in Hidden Valley Dolomite. Three adits. Cerro Gordo Fault approx. 100 m west.		11/17/76	CPS	0302		Merriam(1963)
IV	31	NE, NE 2	16	38	Doug #2	Cu-chrysocholla, azurite; Pb-galena; Zn-sphalerite.	N-S 15 cm thick quartz vein in Hidden Valley Dolomite adjacent to small quartz monzonite stock. Adit greater than 20 m, 1 stope.		11/17/76	CPS	0304		Merriam(1963)
IV	32	SE, NE 2	16	38	Helen	Talc	Gray, pale green, white talc vein 3 m thick in Hidden Valley Dolomite. Adit 6 m.		11/18/76	CPS	0306		Merriam(1963) Page (1951)
IV	33	NW, NW 1	16	38		Cu-malachite, azurite, chalcopyrite, chalcocite; Pb-galena; (Zn)	Quartz veinlets & blebs along fault in Hidden Valley Dolomite. Small prospect.		11/18/76	CPS	0308		Merriam(1963) Page (1951)

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IV	34	1 6	16 16	38 39	Florence Mae West	Talc	Talc zone in Hidden Valley Dolomite. One km long by 200 m wide trending N70W. Twelve prospects, adits, open cuts and shafts.	Some production.	11/30/76	CPS	0311		Merriam(1963) Page (1951)
IV	35	1	16	38	Mars #1	Talc	White talc vein one mtr. wide in Hidden Valley Dolomite. Adit 5 m.		11/30/76	CPS	0310	Delbert Leonard, Box 674 Lone Pine, CA (1975)	Ibid.
IV	36	1	16	38		Cu-malachite, azurite, chalcocite; Pb-galena; (Vanadinite)	Quartz veins in Hidden Val- Dolomite. Three inclined shafts.	Estimate 5-10 percent Cu minerals.	10/20/76	CPS	0177		Merriam(1963)
IV	37	1	16	38	Jupiter	Cu-malachite	Thin milky quartz veins and scattered pcokets of malachite in brecciated Hidden Valley Dolomite. Prospect & adit.		10/20/76	CPS	0176	Delbert Leonard Lone Pine, CA (1975)	Ibid.
IV	38	1	16	38		Talc	Poor exposures white talc in Hidden Valley Dolomite.		10/20/76	CPS	0178		Ibid.
IV	39	1	16	38	Judy	Talc	Hidden Valley Dolomite altered to talc and "quartzite." Two adits.		9/29/76	CPS	0159		Ibid.
IV	40	1	16	38	Old Timer	Cu-malachite, azurite, chalcocite; Pb-galena;--pyrite limonite.	3-10 cm thick replacement quartz vein in Hidden Valley Dolomite. Inclined shaft 20 mtrs.		9/29/76	CPS	0161		Ibid.

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MINERAL AREA	LOC. NO. MAP 3	LOCATION SEC.	LOCATION TWP. (S)	LOCATION RNG. (E)	NAME	COMMODITIES & MINERALS	GEOLOGY & MINE WORKINGS	PRODUCTION, GRADE, RESERVES	FIELD SURVEY DATE	FIELD SURVEY BY	FIELD SURVEY NOTES	OWNER	REFERENCES
IV	41	NE, NE 12	16	38		Talc	Gray talc in lenticular quartzite body surrounded by Hidden Valley Dolomite. Open cut 70 m long, 12 m deep, three benches.	—	9/28/76	CPS	0156		Merriam(1963)
IV	42	1 6,7	16 16	38 39	Holiday	Talc	Gray talc layers in 'Eureka Quartzite." Open cut approx. 30 m deep.	Appears high quality. Estimate large reserves. Recent shipments.	9/28/76	CPS	0153	Interpace Corporation, 290 Los Feliz Blvd Los Angeles, 90039 (213) 663-3361 patented	Ibid.
V	43	11	16	38		Cu-malachite; Pb-galena;--goethite.	Milky quartz veins on margins of andesite porphyry dike. Adit and two prospects.		9/22/76	CPS	0149		Ibid.
V	44	12	16	38	Pine Tree	Pb-galena, anglesite; Cu-chrysocholla--limonite, pyrite, ankerite.	Quartz vein 30 cm thick along fault in Hidden Valley Dolomite. Adit, 30 mtrs.		8/13/76	CPS	0120		Ibid.
V	45	12	16	38	Lee #12	Pb-galena; Cu-malachite, chalcocite, covellite;--limonite, calcite, ankerite.	Quartz veins ½-2 m thick in Hidden Valley Dolomite. Adit, 90 m, drifts, 3 stopes		8/31/76	CPS	0125	Jack & Barbara Smith, Keeler	Ibid.
V	46	12	16	38		Cu-chrysocholla	10-30 cm thick quartz vein Hidden Valley Dolomite. Two adits 15 m & 3 m.		8/5/76	CPS	0110		Ibid.

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V	47	12	16	38	Ella(Silver Spear)	Pb-galena, cerrusite; Cu-tetrahedrite, chrsysocholla; (Ag)	Quartz vein approx. one m thick in Hidden Valley Dolomite. Adit 200 m, several winzes and stopes. Two other adits and one shaft.	Intermittent production 1910-58 with average assay 10% Pb, 01% Zn. 32 oz. Ag, .35 oz. Au. Present owners report $30/ton Ag and recoverable Pb from dump.	8/5/76	CPS	0105	W. Paul Payne (et. al), Box 212, Keeler, CA 93530 (714) 876-4491 (9/76)	Goodwin(1957) Merriam(1963)
V	48	12	16	38	Hart	Pb-galena, cerrusite; Cu-weak staining (Au, Ag, Zn)	Contact Tin Mountain limestone & perdido Fm. Inclined shaft (caved), reported workings at 50, 80, 100, 150 200 foot levels.	Smelter recovery from 40 ton shipment 1936: Pb 20.2%, Zn 3.0%, 15.4 oz. Ag, .115 oz. Au.	9/22/76	CPS	0147		Merriam(1963)
V	49	14	16	38		Cu-azurite, malachite, chalcopyrite, chalcocite; (Ag-ceraragyrite)	Quartz vein in Rest Springs Shale adjacent to small quartz monzonite stock. Prospect.		9/22/76	CPS	0146		Ibid.
V	50	15	16	38		Cu-chrysochol-la	Quartz vein along hanging wall of andesite porphyry sill in Perdido Fm. Shaft, 8 m and three prospects.		9/1/76	CPS	0135		Ibid.
V	51	15	16	38		Cu-chrysochol-la	Contact Tin Mountain. Limestone & Perdido Fm. Two small prospects.		9/1/76	CPS	0134		Ibid.
V	53	15	16	38		Pb-galena; Cu-chrysocholla, chalcocite; --pyrite, grossularite.	Milky quartz veins 5-10 cm thick in Hidden Valley Dolomite. Two adits 8 & 17 m.		9/2/76	CPS	0138		Ibid.

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V	54	15	16	38	Newtown	Pb-galena, cerrusite; Cu-chrysocholla--limonite, calcite	NE & NW trending quartz veins in lost Burro F. east of San Lucas Fault. Shaft & 2 adits, extensive underground workings.		8/10/76	CPS	0112		Merriam(1963)
V	55	15	16	38		Cu-malachite	Branching limonitic quartz veins in Hidden Valley Dolomite & altered quartz monzonite. Adit, 70 m, one winze.		9/1/76	CPS	0132		Ibid.
V	56	15	16	38	Upper Newtown	Pb-Cerrusite, anglesite; Cu-malachite, azurite;--limonite, calcite, siderite.	Quartz veins one mtr. thick in Lost Burro Fm east of San Lucas Fault. Adit 100 m		8/12/76	CPS	0115		Ibid.
VI	57	6	16	40	Anton and Pobst	Cu-chalcopyrite chrysocholla; Wollastonite	Interstitial chalcopyrite in wollastonite schist interlayered with garnet tactite. Open cut 15 m wide, 5 m high	Estimate 15% chalcopyrite.	1/25/77	CPS	0330		McAllister (1955, 56)
VI	58	6	16	40	Pinion Extension, Green Eye	Cu-chalcopyrite azurite, chrysocholla;--pyrite	Traces of Cu minerals scattered in garnet tactite. Numerous short adits & prospects.		1/18/77	RDK	0401		Ibid.
VI	59	7	16	40	Cerrusite	Pb-galena, cerrusite; Cu-chalcopyrite, azurite, malachite, (chrysocholla); (Ag, Au);--pyrite, hematite.	Veins along faults in marble tactite and shale adjacent to quartz monzonite contact. Eight adits, shafts, prospects.	Small total production 1938-ore $12-25/ton.	1/18/77	RDK	0404		Goodwin(1957) McAllister (1955, 56), Norman and Stewart(1951)

APPENDIX I, TABLE 2

REPORTED OCCURRENCES OF SELECTED MINERALS

Reported Occurrences of Selected Minerals

ABBREVIATIONS FOR REFERENCES

C30	California State Mining Bur. Bull. 30, 1904
C34	California State Mining Bur. Bull. 34, 1903
C47	California Jour. Mines and Geology, v. 47, no. 1, 1951
C50	California State Mining Bur. Bull. 50, 1908
C53	California Jour. Mines and Geology, v. 53, 1957
C144	California Div. Mines Bull. 144, 1948
C176	California Div. Mines and Geology Bull. 176, 1957
C194	California Div. Mines and Geology Bull. 194, 1973
CSR8	California Div. Mines Spec. Rept. 8, 1951
CSR42	California Div. Mines Spec. Rept. 42, 1955
CSR49	California Div. Mines Spec. Rept. 49, 1956
EG58-1	Economic Geology, v. 58, no. 1, January-February 1963
GQ612	U. S. Geol. Survey Geologic Quadrangle Map
IC8158	U. S. Bur. Mines Information Circular 8158, 1963
MR39	U. S. Geol. Survey Mineral Investigations Resource Map, 1964
MW	Mining World, October 1960
MY1964	U. S. Bur. Mines Minerals Yearbook, 1964
PP110	U. S. Geol. Survey Prof. Paper 110, 1918
PP408	U. S. Geol. Survey Prof. Paper 408, 1963
quad. map	U. S. Geol. Survey Topographic map, 15-minute series
RI6013	U. S. Bur. Mines Report of Investigations 6013, 1962
SM12	Report of the State Mineralogist (California), 1894-95
SM15	Report of the State Mineralogist (California), 1915-16
TP2916	Technical Publication, Naval Ordinance Test Station, China Lake, California.

Appendix I – Table 2

REPORTED OCCURRENCES OF SELECTED MINERALS

Excluding natural gas, petroleum, and some deposits of sand, gravel, stone, diatomite, and gypsum

Compiled from card file of Conservation Division, U.S. Geological Survey, Menlo Park, California

SALINE PLANNING UNIT – 01–11, INYO COUNTY, CALIFORNIA

Mineral Area	Index No. Map Sheet 3	LOCATION–MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main––other	Reference
			11	37	Iron Dike group							
I	1	W½ 2	11	37	Two prospects						Fe(?) (?)	C34 quad. map
I	2	S½ 21	11	37	Waucoba Tungsten (Last Roso) 168' incl.shaft, 3 levels	W layered Cu,Au qtz vein	small	argillite	1939-1942	some	1-2% WO_3--Cu,Au,Pb	C47,C53
I		NW¼NE¼ 29	11	37	Two prospects						W(?)	GQ612
			12	37	Oasis group						(?)	C34
I		4,7,9, 20	12	37	Prospects, adits, shaft						Pb,Ag,Au(?)	GQ612
I	3	SE¼ 5	12	37	Bunker Hill:-See 6 S, 35 E; 9 S,34 E) (12 S, 37 E. prob. correct loc.)				1920		Pb,Ag,Au	GQ612
I		17,20	12	37	Lead Hill	lode				(?)	Au	C47,GQ612
I	5	E½ 19	12	37	Lucky Boy (Blue Monster?) two adits			Tamarask dolo		(?)	Pb,Ag(?)	GQ612
I	4	N½ 20	12	37	Monster (Blue Monster) 275' adit, 200'x12' stope	irreg. lens		brecciated ls.	1908- 1921 1935	intermit. 50 tons	Pb,Ag,Cu ($100/ton)	C53,PP110 GQ612
I		W½SE¼ 32	12	37	mine	contact		ls/q.m.			Talc	GQ612
		approx.	12	37	Roosevelt (F.D.R.) adit, open cut				1935-1941		9 Pb, 1 Cu, 19 Ag, 0.9 Au	C53
			13	37	Burros Mines						(?)	C34

REPORTED OCCURRENCES OF SELECTED MINERALS––Continued

Mineral Area	Index No. Map Sheet 3	LOCATION–MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main––other	Reference
			13	37	Francis group						Talc(?)	C34
		approx.	13	37	Golden Star				1917	small	15 Pb, 31 Ag	C53
			13	37	MacLean group (See 10S, 37E)					(?)	Ag,Pb(?)	C34
		SE(?)	13	37	Keys mine,two inclines, drifts	vein	1-2 x	granite		(?)	Au	SM12
II		NW¼ 3	13	37	Willow Creek Talc, two adits, glory hole	meta-ls pendant	20 x	granite	1941-42	1,000 tons	Talc (steatite)	CSR8
II		NE¼ 3	13	37	White Eagle, three adits, open cut	contact	160 x 500	dolo/q.m.	1953-59	3,500 ± tons	Talc (steatite?)	CSR8, C47
II		S½NW¼ 11	13	37	Eleanor (Grey Eagle,Rogers)	Meta-dolo	x 150	dolo	1951-59	some	Talc (steatite)	CSR8, C47
II	7	NW¼SW¼ 11	13	37	adit (Bradley, Doris D.?)	meta-ls		Paleozoic		(?)	Talc(?)	GQ612
II	7	NE¼NW¼	13	37	adit (Bradley, Doris D.?)	meta-ls		Paleozoic		(?)	Talc	GQ612
II	7	11 or 14	13	37	Bradley (Doris D.) adit, winze, open cut	meta		ls & dolo		(?)	Talc (steatite?)	C47, C176
		22 or 23	13	37	Bunker Hill (5, 12-37 is correct)						Pb, Ag, Au	
III		34	13	37	Mountain View (see 14,14-37)				1948	small	32 Pb, 1 Ag	C53
		possibly	14	37	Laura and McAvoy	qtz vein			pre-1894		Au	SM12
		approx. NE	14	37(?)	Sweitzer mine, 130' adit	vein	small	granite		(?)	rich Ag, Cu--Pb	SM12
			14	37	Brown Bear						(?)	C34
			14	37	Owens Lake View						(?)	C34

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION–MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
			14	37	Paymaster						Au(?)	C34
III		13 or 14 or 15	14	37	Highland Chief, 100' adit	qtz vein	1-2 x	granite		(?)	Au	C47
III		approx. 14	14	37	Mountain View, 165' adit	qtz vein	3 x				Au, Cu	SM15
III	9	NW¼SE¼ 15	14	37	Keynote (Key Not, Golden Princess) 10 adits 150'-750'	two veins	2-4 x		1878-94	$500,000	Au--Cu	C47
		approx. 23	14	37	Golden Eagle	lode				(?)	Au	C47
III	19	S½ 25	14	37	Big Horn, 200' adit, 650' adit, 380' incl. shaft	three veins	2-8 x	granite	1878-1939	>$10,000	Au, Ag, Cu, Pb	C53
III		possibly 25, 26	14	37	Gavalan, Montano, Chilula, San Antonio, 400' adit, 50' incls.	vein, replace.	5 x			considerable stoping	Au, Ag	SM12
		NE¼SW¼ 31	14	37	Duarte mine, adit						Au(?)	quad. map
		S½SW¼ 32	14	37	adit						Au(?) or Ag-Pb(?)	quad. map
			15	37	Internatl. Min. & Chem.					none	Be	MW 10/1960
		approx. 14 or	15	37	Nellie H., 175' adit	qtz vein	½-2 x	granite	1913-19	71+ tons	high Au, Ag--Cu, Pb	C53
III		1 or 12 (?)	15	37	Tom Casey, 400' adit	vein	1-4 x	porph/ls		(?)	Au	C47
		SW¼ 6	15	37	Two adits						(?)	quad. map
		11,13,14 21,23,28, 32,33,34	15	37	pits, adits, shafts, quarries					(?)	(?)	quad. map

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION--MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
III	28	E½ 14	15	37	Burgess (Iron Sides) 200' incl., 60' v. sh.(2), 200' XC	qtz veins	1-2 x	Triassic ls		some	Au--Pb	C47, PP408
		NW¼ 17	15	37	Long John (Union) shafts, adits	fissure	4-6 x	ls	1925-39	$60,000	6 Pb, 9 Ag--Cu,Au,Zn	C53, PP408 MR39
		NW¼NW¼ 17	15	37	Black Warrior, two adits					(?)	Au,Ag,Cu,Pb(?)	quad. map
		S½ 20, N½ 29	15	37	Inyo (Sorenson, White Caps), 100' adit	stringer zone	18 x	grd	1940's	2 tons beryl	5-17% BeO	C47, C176 RI6013,IC8158
		approx. 30	15	37	Premier Marble Products	see Bowens ls map			1963-64	some	dolomite (>20 mil. t., 1966)	MY1964, C194
		35	15	37	Copper Summit					(?)	(?)	C47
			11	38	none							
			12	38	none							
VII		Most of E½	13	38	Saline Valley playa brine and clays	lake deposit			As of 1974	none	Lithium (up to 0.1% Li)(see Addenda)	TP2916, p.24
VII		W½	13	39	"	"			"	"	"	"
		8(?)	14	38	Blue Monster (Monster) See 20, 12-37							PP110
II	8	E¼ cor. 18	14	38	Hilderman (Snow Flake) two open pits					some(?)	Talc	C47, C176
III		NW¼ 19	14	38	Cinnamon, 150' adit, 350' adit, 2-stamp mill	qtz vein	2 x	granite		(?)	0.9 Au	C47
III		19(?)	14	38	Journigan's group, adit	qtz vein	3 x 30			(?)	Au--Cu	C47

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION--MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
		approx. 14 &	15	38	Vega (Gold Standard), 4 adits, open cut	two qtz veins	x 2100	qtz monz.		some	3 Au,58 Ag,11 Cu--Zn	C47
			15	38	Casey mine(see 15-37)					(?)	(?)	C34
			15	38	Ironsides group (see 14,15-37)							C34
		approx.	15	38	Bananca,250' adit, etc.	veins				(?)	(?)	SM12
III	21	NE¼NW¼ 3	15	38	Big Silver (Essex), adits	veins, repl.		q.di/ls	1928	some	30-66 Ag,2-9 Pb--CU,Au	C53
III	23	SW¼SW¼ 9	15	38	Trepier mine, open pit					(?)	(?)	quad. map
		15 and (?) 13	15 16	38 38	North Star, shafts, cuts	qtz veins	2-6 x	granite		(?)	Pb,Cu--Au,Ag	C53
IV	29	SE¼ 35, SW¼ 36	15	38	White Mountain (Bonham Talc) cuts, about 40 adits, 30 acres	meta		dolo., ls, qtzite	(?)1950-1957	>25,000 tons	Talc (steatite)	CSR8, C47 C176, PP408
IV	34	SE 36 NE 1 NE 6	15	38	White Mountain (Florence) cuts, adits, shafts-½ x 1/10 mi	meta		dolo., ls, qtzite	1938-59	>8,000 tons	Talc (steatite)	CSR8, C47 C176, PP408
			16	38	Badgette - Lafayette					(?)	Ag,Pb(?)	C34
		approx.	16	38	Farrington (see 1,2,14-40)				1913-14	(?)	43 Pb,31 Ag--Cu,Au	C144, C53
			16	38	Golden Reef				1937(?)	small	Au,Cu	C144
		approx.	16	38	Gordon				1913	some	24 Pb,29 Ag--Cu,Au	C53
		approx.	16	38	Hall				1918	some	13 Pb,21 Ag--0.05 Au	C53
		approx.	16	38	Inden Lead & Silver Mng. Co.				1918	some	23 Pb,25 Ag--Cu,Au	C53
			16	38	New Enterprise					none		C53
		approx.	16	38	Givens					moderate	Au,Ag,Cu--Pb	C53

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION--MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main---other	Reference
		approx.	16	38	Irwin				1909	some	38 Pb,6 Cu,8 Ag--Au	C53
		approx.	16	38	Lost Frenchman				1911	small	32 Pb,28 Ag,2 Cu-- 0.1 Au	C53
		approx.	16	38	Lucky Strike				1951	small lot	20 Pb,4 Ag	C53
		approx.	16	38	Reid						Pb,Ag,Au	C53
		approx.	16	38	Robin Hood				1913	1 shipment	39 Pb,33 Ag--Au,Cu	C53
			16	38	Santa Maria					(?)	Ag,Pb(?)	C53
		approx.	16	38	Schaffer				1911-18	some	62 PB,77 Ag,6 Cu, high Au	C53
		approx.	16	38	Sure Contest				1937	some	10 Pb,7 Ag--Cu	C53
		approx.	16	38	Townsend				1910-12	small	30 Pb,39 Ag,3 Cu-- 0.01 Au	C53
		approx.	16	38	Wiggington				1918	small	12 Pb,14 Ag--Cu,Au	C53
		approx.	16	38	Warnken(?)				1943-45	some	6 Pb,10 Ag--Cu	C53
		approx.	16	38	McIlroy & Sons slate	N.30 W. beds					slate (flagstones, roof granules)	C34
		1	16	38	Alvah						Ag,Pb(?)	C53
		1(?)	16	38	Mass					(?)	Talc (steatite)	C176
IV	34	1	16	38	White Mtn. (Florence) see 36,15-38							
		1 or 2	16	38	Alberta,incl. sh., drifts, stopes				1949-54	some	Talc (steatite)	C47
		1,2,12-14,23,24,30	16	38	many shafts, adits, pits					from many	(?)	quad. map
IV	42	1 or 12	16	38	Branson (Holliday?)					(?)	Talc (steatite)	C176

REPORTED OCCURRENCES OF SELECTED MINERALS—Continued

Mineral Area	Index No. Map Sheet 3	LOCATION–MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main––other	Reference
IV	30,31(?)	2	16	38	Auguste (August)					(?)	Au	C47
		SW¼ 7	16	38	Flagstaff						(?)	PP408
		11,12, 13,14	16	38	Royal group (Cerro Gordo Spear, Silver Sprea) 200' shaft	3 veins	1-3 x	ls	to 1940	$30,000	Pb,Zn,Ag--Cu,Ag	C53, PP408
		12(?)	16	38	Skinner					(?)	Talc (steatite)	C176
V	48	12,13	16	38	Hart (Cerro Gordo Ext., Lead Queen)	vein	1½ x		1936	40 tons	15 Ag,20 Pb,3 ZN--Au, Cu	PP408
V		12,13, 23,24	16	38	Cerro Gordo (incl.Aries), 30 mi. underground workings	fissures		marble	Total post-1906	>$17 million >$6 million	Pb,Ag,Zn,Cu--Cd(?)	C53, C176 PP408, MR39
V		13	16	38	Baushey (Bonshay)					(?)	Ag	C34
V	47	13	16	38	Ella group, two adits	repl.		ls	1910-58	some	35 Cu,32 Ag,10 Pb-- 1 Zn,Au	C53, PP408
V		SE¼ 13 et al	16	38	Cerro Gordo mine, quarry	sed.		ls	(?)	some	ls,dolo.(large,1963)	PP408, p.6
V		14	16	38	Mayflower group, 40' shafts, adits				(?)	1 shipment	22 Pb,46 Ag--Cu	C53, C144
V		SW¼ 14	16	38	Peterson, also KE Tunnel			ls			Ag,Pb(?)	PP408
V		14, NE¼ 23	16	38	Ventura (Silver Reef, Sunset) shaft, adits, 1000' DD holes				pre-1949 1949	$100,000	Pb,Ag,Zn	C53, Mr. 39 PP 408
		15	16	38	Swansea Chief, two 150' shafts	fissure		ls	1912		12 Pb,6 Ag--Au	C53
		19(?)	16	38	Lakeview, 40' sh., levels, 2 stopes	lenses		ls/qtzite	(?)	2,000± tons	Talc (steatite?)	CSR8, C47
		19,30,31	16	38	Inyo Marble Co. See 4,16-37							
		23 or 24	16	38	Ventura (same as 23,16-38?)						Pb,Ag(?)	C34

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION--MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
		23or24(?)	16	38	San Benito					(?)	Pb,Ag(?)	C34
		S½ 23,24 N½ 26	16	38	Estelle & Morning Star (Riff Raff, Sure Contest, Troegers),18,027' wkgs.				1916-37	large	Pb,Ag,Zn--Cu,Au	C53, PP408 C144, MR39
		24(?)	16	38	Occident (same as Estelle?)					(?)		C34
		NW¼ 24	16	38	Ignacio,4,000' adits,glory hole					some	Ag,Pb (orig.discovery)	PP408
			11	39	none							
			12	39	none							
		9	13	39	Saline Valley	bedded			as of 1962	none	20-30% Mn,0.6 WO_3--calcite	C47, EG58-1
		E½ 18	13	39	Lower Warm Spring,Palm Spring	cones		travertine			Mn(?)	EG58-1,GQ612
			14	39	none							
		approx.	15	39	Valentine group, outcrops	veins		gr/ls		none	2-16 Cu,9-14 Ag--Au	C50, C144
		approx.27	15	39	outcrop	contact		q.m./skarn			Wollastonite,stilbite	CSR42
		SW¼SW¼ 29	15	39	prospect					(?)	(?)	quad. map
			16	39	Chloride-Bromide group					(?)	Ag,Pb(?)	C34
		approx.	16	39	Gehrig					small	Au,Ag,Cu	C144
		approx.	16	39	Bean-Smith (Royal Group?)				1909	small	32 Pb,7 Ag,6 Cu--0.06 Au	C53
		approx.	16	39	Berry Hill (Swansea Chief?)				1911, 1918	(?)	26 Pb,15 Ag--0.01 Au,Cu	C53, C144
		approx.	16	39	Lookout No. 1,25' sh.,15'wze				1919	small	30 Pb,28 Ag,1 Cu--0.02 Au	C53
		approx.	16	39	McDonald				1918	(?)	23 Pb,38 Ag. 3 Cu	C53
		approx.	16	39	Staats				1911	small	42 Pb,35 Ag	C53

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
		approx.	16	39	Sterling Queen				1938 1939	1 shipment cyanided	9 Pb,6 Ag,0.1 Au	C53
		approx.	16	39	Stockton				1918	some	21 Pb,14 Ag--Au	C53
		approx.	16	39	Tullos				1911	1 shipment	18 pb,69 Ag	C53
		approx.	16	39	Western Metals (Ingomar)				1918	some	42 Zn	C53
		approx.4	16	39	outcrop (most accessible)			Rest Spr. Shale		none	chiastolite (occurs widely, 1962)	CSR42
IV	34	6	16	39	White Mtn.(Florence) see 36,15-38						Talc	
		6,7,18, 19,20	16	39	prospects,adits					some	(?)	quad. map
IV	42	7	16	39	(?)						Talc	BLM rept.
		18	16	39	San Lucas (Sam Lucas,Perser-verence)	vein	4-6 x	lx	1915-18		3 Cu,17 Ag--0.6 Pb, 0.03 Au	C53
		18	16	39	See 12,13,23,24,16-38						Pb,Ag,Zn	
		19	16	39	Newsboy	qtz.veins		ls	1913		17 Pb,74 Ag,3 Cu,0.5 Au	C53,PP408
		19(?)	16	39	Wittikint (Belmont?)					none(?)	Pb,Ag(?)	C34
		NE¼ 29, NW¼ 20	16	39	Belmont,50' shaft, 3,600' workings	qtz veins	1-6 x	granitic	pre-1938	$500,000	Ag,Pb,Cu	C53, PP408
			11	40	none							
			12	40	none							
			13	40	none							
		NE¼NW¼ 1	14	40	Copper Belle	contact		ig/marble	1918	15,000	Cu	CSR42, C34

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION–MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main––other	Reference
		SW¼ 1, SE¼ 2	14	40	Ubehebe (Farrington, Waterson, Butte) adits, open cuts				1908-51	2,940 tons	20 Pb,13 Zn,5 Ag--U	CSR42, 49
		1,2,12, 22,23,25, 26	14	40	adits, prospects					some(?)	Cu(?),Pb,Ag(?)	quad. map
		SE¼ 22	14	40	Blue Jay, Copper Queen, adits, shaft, trenches			tactite	1915	20 tons	4,000 lb Cu,1,199 oz Ag	CSR42, C144
		approx.22	14	40	Maries group					none(?)	Cu	C30, p.300
		22,23,26(?)	14	40	Sanger group, prospects					none	Cu	CSR42, C50
		SW¼ 25	14	40	Star, prospect		50 x 800			none	Cu	C47, C144
		NW¼NE¼ 26	14	40	Copper Queen No. 1, 35' shaft	cont. meta.	50 x					CSR42
VIII		NE¼SE¼ 10	15	40	Bonanza (Hesson, Clipper), 65' adit, 30' shaft	Cont. meta.		ls		few tons(?)	2 Cu--Au,Ag,Pb, 0.016 $_{e}$U	CSR49, C47
		11	15	40	Inyo Copper Mining & Smelter Co.			ls,qtzite		none	4-41 Cu--Au,Ag	CSR42
		NE¼NW¼ 12	15	40	Copper King(Copper Giant adits, drifts	contact	1 x	ig./marble		little (?)	Cu	CSR42, C47
		12(?)	15	40	Roberts & Derat, outcrop					none(?)	Cu	C50
		13	15	40	Wedding Stake (and Red Bear?)	veins		ls			35 Cu,103 Ag,Pb--Au	C50, CSR 42
		SW¼ 13	15	40	Lippincott (Lead King) 625' adit	vns-repl.		dolo. marble		2,000	25-40 Pb,11-38 Ag, 4-11 Zn--Cu, U	CSR49, C47
		Cen. 13	15	40	Homestake, pits, trenches					none(?)	Talc	CSR42, C176
		14(?)	15	40	Raven, 2,000' workings			ls		some	Zn,Pb,Ag	CSR42, C53
		SE¼ 14(?)	15	40	outcrop	vein	1 x 25	q.m.			Barite--qtz,FeO_x	CSR42

REPORTED OCCURRENCES OF SELECTED MINERALS—Continued

Mineral Area	Index No. Map Sheet 3	LOCATION—MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main—other	Reference
VIII		36(?)	15	40	outcrop	pegmatite					Mo,W--magnetite	CSR42
VIII		SE¼ 36	15	40	Dodd's Springs-Trail	vein	5-15 x 1800			none	Cu(malachite)	C47, C144
		NE¼NW¼ 1	16	40	Shirley Ann (Eureka?) 200' wkgs			marble			Cu,Pb	CSR42
VIII		1	16	40	Navajo Chief	vein	50 x 1000	ls/gr			Cu--Au,Ag	C47, C144
VIII		1	16	40	Eureka,80' sh.,100' drifts		5 x 150			none	Cu--Pb	C50
VIII		1or2(?)	16	40	Scott and Titus					none	Au,Ag,Pb--Cu	C50
VI	57	NE¼SW¼ 6	16	40	Anton and Pobst(Inyo),100'wkgs				1916	400 tons	10 Cu	C144, CSR42
VI	58	SE¼SW¼ 6	16	40	May B, shallow workings	vein					Pb,Cu	CSR42
VI		6(?)	16	40	Rambler No. II	vein		shale		none(?)	Cu--Pb	CSR42
VI		6,7,17, 18,20	16	40	adits - see other listings					(?)	Cu	quad. map
VI		7	16	40	adit - see other listings					(?)	Pb,Ag	quad. map
VI	59	NW¼SE¼ 7	16	40	Cerussite	vein		ls	1954	small	Pb,Ag ($12-$25)	CSR42, C47
VI		SE¼NW¼ 7	16	40	Pinion Ext. and Green Eye	fractures		q.m.			Cu stain	CSR42
VIII		approx. 12	16	40	Twin Sisters			quartz		none(?)	Cu	CSR42
VIII		SE¼SW¼ 17,20	16	40	Copper Queen - Lucky Boy	qtz. vein		q.m.			Cu	CSR42
VIII		NW¼NE¼ 18	16	40	adits (75',90'),open cuts	tactite		marble/q.m.			Cu stain	CSR42
			15	41	Contact mines (Lippincott?)					(?)	(?)	C34, CSR42
			15	41	Overlook group					(?)	(?)	C34
		NW¼ 5	15	41	Sally Ann(Copper Knife)80' adit	tactite		ls Lost Burro Fm.	1902-51	none	Cu	CSR42

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
		SW¼14(?)	15	41	Ubehebe (Stone Pencil),adits			ls,dolo.	pre-1945 -1959	some	Talc(steatite) (substantial,1959)	C47, C176
		Btwn Dodds Sprg. & Racetrack 16	15	41	Butte, 600' adit	oxidized			1927-30		56Pb,15 Ag(19 Cu)--Au	C53, C144
		SW¼NE¼ 17	15	41	Ulida(Walker),two adits	veins		gr/ls		none	Cu--Au,Ag	CSR42, C47
		18	15	41	Settle Up					none(?)	Cu	C47
VIII		20,21	15	41	Alvord group	contact	10 x 300	gr/ls		none	W	C47
		21	15	41	Shamrock,25' incline	cont.meta		q.m./marble		none(?)	Cu	CSR42
		NW¼23(?)	15	41	Keeler(White Horse?)						Talc	C176, C47
VIII		SW¼SW¼30	15	41	Cuprotungstite(Alvord?) 20' open cut		½ x 1				W--Cu	CSR42
VIII		31	15	41	outcrop	veinlets		q.m.			Cu--tourmaline	CSR42
VIII		S½ cor. NW¼ 33	15	31	Monarch,50' sh.,100' drifts	vein		granite	1915	small	W (Huebnerite)	CSR42
		21	16	41	Hourglass, outcrop	veinlets		pegmatite		none(?)	Cu--Th(?)	CSR42
					ADDENDA							
III		approx.21	14	38	Hunter Spring	water residue				none	0.8% Li	TP2916
III		28	14	38	Vega Spring	water residue				none	1.2% Li	TP2916
VII		approx.8	14	39	Sample 4	brine residue				none	0.2% Li	TP2916
VII		approx.17	14	39	Sample 11	brine residue				none	0.4% Li	TP2916
VII		21	14	39	Samples 46,47	brine residue				none	0.1%,0.2% W	TP2916

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Mineral Area	Index No. Map Sheet 3	LOCATION-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	MINERAL DEPOSIT Type	Size(feet) Thick x Long	Host rock	PRODUCTION & (RESERVES, DATE) Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
VII		32	14	39	brine residue					none	0.2% W	TP2916
			14	38, 39	"On the playa'	evaporite				none	Na SO (700,000±, 1963)	TP2916
		approx.	14	38, 39	"In Saline Valley"	evaporite			1883-1907	some	Borax	TP2916, C176
			14	38	Saline	evaporite			1911-1954	>2,000 t.	Salt	C176

APPENDIX II

ADMINISTRATIVE REPORT - FOR OFFICIAL USE ONLY

Mineral Resources and Exploration Potential

SALINE PLANNING UNIT

Inyo County, California

by

Roscoe M. Smith

U.S. Geological Survey, Menlo Park, Calif.

This report has not been edited
or reviewed for conformity with
Geological Survey standards

March 1976

Contents

Illustrations

Plate 1. Geologic map, scale 1:62,500

INTRODUCTION

Location

The Saline Planning Unit includes parts or all of the following 25 townships (fig. 1) in the Inyo Mountains, Saline Valley, and the Panamint Range, Inyo County, California:

Township S.	Range E.	Base and Meridian
11	37-40	Mount Diablo
12	37-40	do
13	37-40	do
14	37-40	do
15	37-41	do
16	38-41	do

All sections in all 25 townships are included on the maps and in the table of mineral occurrences that accompany this report.

All sections are in the area shown on the Death Valley sheet except the northern part of T. 11 S. which is on the Goldfield sheet (topographic) or Mariposa sheet (geologic).

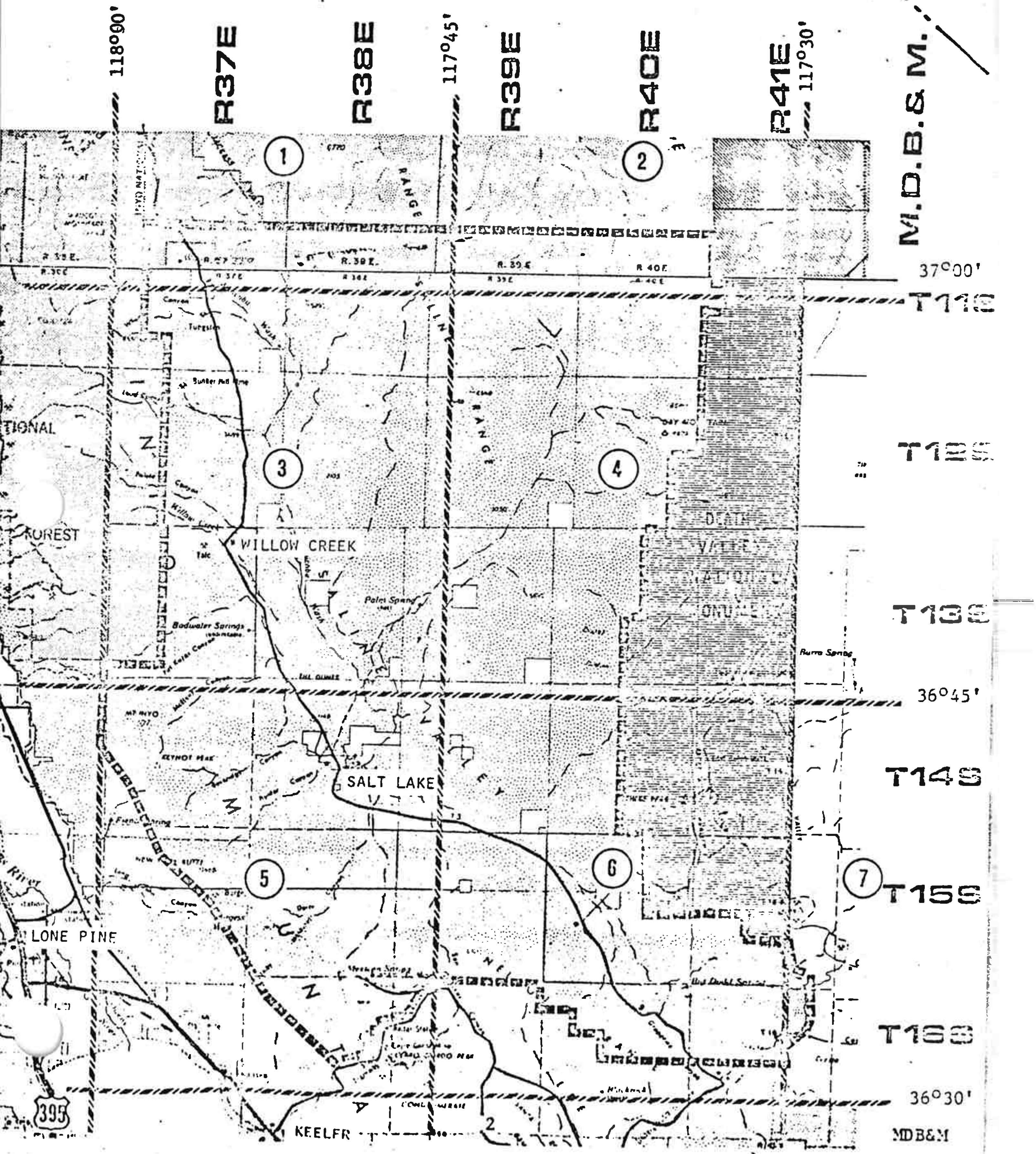
Acknowledgments

The table (p. 3-3f) was compiled from a card file of Conservation Division, U.S. Geological Survey, Menlo Park, California.

Sections on General geology, Commodities, and Principal deposits are direct copies from publications referenced in the table.

The geologic map (pl. 1) is an enlargement of part of the original compilation by Ross, 1967, for the published map U.S. Geological Survey Map I-506.

Figure 1. INDEX MAP
SALINE PLANNING UNIT - 01-11
Inyo County, California
[Index numbers: See p. 5]



REPORTED OCCURRENCES OF SELECTED MINERALS

Excluding natural gas, petroleum, and some deposits of sand, gravel, stone, diatomite, and gypsum

Compiled from card file of Conservation Division, U.S. Geological Survey, Menlo Park, California. See USGS Map MR 49

Tabulated by range — larger deposits indexed as shown on MDLU map

SALINE PLANNING UNIT - 01-11, INYO COUNTY, CALIFORNIA

Index No. MDLU map	Location-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit: Type	Mineral deposit: Size(feet) Thick x long	Mineral deposit: Host rock	Production and [Reserves, date]: Year	Production and [Reserves, date]: Amount	Commodity (Cu, Pb, Zn in percent; Au, Ag in oz per ton) Main--other	Reference
		11	37	Iron Dike group						Fe(?)	C34
	W½ 2	11	37	Two prospects						(?)	quad. map
	S½ 21	11	37	Waucoba Tungsten (Last Rose) 168' incl. shaft, 3 levels	W layered Cu, Au qtz vein	small	argillite	1939-42	some	1-2% WO_3--Cu, Au, Pb	C47, C53
	NW¼NE¼ 29	11	37	Two prospects						W(?)	GQ612
		12	37	Oasis group						(?)	C34
	4, 7, 9, 20	12	37	Prospects, adits, shaft						Pb, Ag, Au(?)	GQ612
	SE¼ 5	12	37	Bunker Hill:- See 6 S, 35 E; 9 S, 34 E) (12 S, 37 E. prob. correct loc.)				1920		Pb, Ag, Au	GQ612
	17, 20	12	37	Lead Hill	lode				(?)	Au	C47, GQ612
	E½ 19	12	37	Lucky Boy (Blue Monster?) two adits			Tamarask dolo		(?)	Pb, Ag(?)	GQ612
	N½ 20	12	37	Monster (Blue Monster) 275' adit, 200' x 12' stope	irreg. lens		brecciated ls.	1908-21 1935	intermit. 50 tons	Pb, Ag, Cu ($100/ton)	C53, PP110 GQ612
	W½SE¼ 32	12	37	mine	contact		ls/q.m.			Talc	GQ612
	approx.	12	37	Roosevelt (F.D.R.) adit, open cut				1935-41		9 Pb, 1 Cu, 19 Ag, 0.9 Au	C53
		13	37	Burros Mines						(?)	C34
		13	37	Francis group						Talc(?)	C34
	approx.	13	37	Golden Star				1917	small	15 Pb, 31 Ag	C53
		13	37	MacLean group (See 10 S, 37 E)					(?)	Ag, Pb(?)	C34
	SE (?)	13	37	Keys mine, two inclines, drifts	vein	1-2 x	granite		(?)	Au	SM12
	NW¼ 3	13	37	Willow Creek Talc, two adits, glory hole	meta-ls pendant	20 x	granite	1941-42	1,000 tons	Talc (steatite)	CSR8
1	NE¼ 3	13	37	White Eagle, three adits, open cut	contact	160 x 500	dolo/q.m.	1953-59	3,500± tons	Talc (steatite?)	CSR8, C47
	S½NW¼ 11	13	37	Eleanor (Grey Eagle, Rogers)	meta-dolo	x 150	dolo	1951-59	some	Talc (steatite)	CSR8, C47
	NW¼SW¼ 11	13	37	adit (Bradley, Doris D.?)	meta-ls		Paleozoic		(?)	Talc(?)	GQ612
	NE¼NW¼ 14	13	37	adit (Bradley, Doris D.?)	meta-ls		Paleozoic		(?)	Talc	GQ612
	11 or 14	13	37	Bradley (Doris D.) adit, winze, open cut	meta		ls & dolo		(?)	Talc (steatite?)	C47, C176

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Index No. MDLU map	Location-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit: Type	Size (feet) Thick x long	Host rock	Production and [Reserves, date]: Year	Amount	Commodity (Cu, Pb, Zn in percent; Au, Ag in oz per ton) Main--other	Reference
	22 or 23	13	37	Bunker Hill (5, 12-37 is correct)						Pb, Ag, Au	
	34	13	37	Mountain View (see 14, 14-37)				1948	small	32 Pb, 1 Ag	C53
	possibly	14	37	Laura and McAvoy	qtz vein			pre-1894		Au	SM12
	approx. NE	14	37(?)	Sweitzer mine, 130' adit	vein	small	granite		(?)	rich Ag, Cu--Pb	SM12
		14	37	Brown Bear						(?)	C34
		14	37	Owens Lake View						(?)	C34
		14	37	Paymaster						Au(?)	C34
	13 or 14 or 15	14	37	Highland Chief, 100' adit	qtz vein	1-2 x	granite		(?)	Au	C47
	approx. 14	14	37	Mountain View, 165' adit	qtz vein	3 x				Au, Cu	SM15
2	NW¼SE¼ 15	14	37	Keynote (Key Not, Golden Princess) 10 adits 150'-750'	two veins	2-4 x		1878-94	$500,000	Au--Cu	C47
	approx. 23	14	37	Golden Eagle	lode				(?)	Au	C47
3	S½ 25	14	37	Big Horn, 200' adit, 650' adit, 380' incl. shaft	three veins	2-8 x	granite	1878-1939	>$10,000	Au, Ag, Cu, Pb	C53
	possibly 23, 26	14	37	Gavalan, Montano, Chilula, San Antonio, 400' adit, 50' incls.	vein, replace.	5 x			considerable stoping	Au, Ag	SM12
	NE¼SW¼ 31	14	37	Duarte mine, adit						Au(?)	quad. map
	S½SW¼ 32	14	37	adit						Au(?) or Ag-Pb(?)	quad. map
		15	37	Internatl. Min. & Chem.					none	Be	MW 10/1960
	approx. 14 or 15		37	Nellie H., 175' adit	qtz vein	½-2 x	granite	1913-19	71+ tons	high Au, Ag--Cu, Pb	C53
	1 or 12(?)	15	37	Tom Casey, 400' adit	vein	1-4 x	porph/ls		(?)	Au	C47
	SW¼ 6	15	37	Two adits						(?)	quad. map
	11, 13, 14, 21, 23, 28, 32, 33, 34	15	37	pits, adits, shafts, quarries					(?)	(?)	quad. map
	E½ 14	15	37	Burgess (Iron Sides) 200' incl., 60' v. sh. (2), 200' XC	qtz veins	1-2 x	Triassic ls		some	Au--Pb	C47, PP408
	NW¼ 17	15	37	Long John (Union) shafts, adits	fissure	4-6 x	ls	1925-39	$60,000	6 Pb, 9 Ag--Cu, Au, Zn	C53, PP408 MR39
	NW¼NW¼ 17	15	37	Black Warrior, two adits					(?)	Au, Ag, Cu, Pb(?)	quad. map
4	S½ 20, N½ 29	15	37	Inyo (Sorenson, White Caps), 100' adit	stringer zone	18 x	grd	1940's	2 tons beryl	5-17% BeO	C47, C176 RI6013, IC9158
5	approx. 30	15	37	Premier Marble Products	see Bowens ls map			1963-64	some	dolomite [>20 mil. t., 1966]	MY1964, C194
	35	15	37	Copper Summit					(?)	(?)	C47
		11	38	none							
		12	38	none							

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Index No. MDLU map	Location-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit: Type	Size(feet) Thick x long	Host rock	Production and [Reserves, date]: Year	Amount	Commodity (Cu, Pb, Zn in percent; Au, Ag in oz per ton) Main--other	Reference
6	Most of E½ W½	13 13	38 39	Saline Valley playa brine and clays	lake deposit			As of 1974	none	Lithium [up to 0.1% Li] [see Addenda]	TP2916, p.24
	8(?)	14	38	Blue Monster (Monster) See 20, 12-37							PP110
	E½ cor. 18	14	38	Hilderman (Snow Flake) two open pits					some(?)	Talc	C47, C176
	NW¼ 19	14	38	Cinnamon, 150' adit, 350' adit, 2-stamp mill	qtz vein	2 x	granite		(?)	0.9 Au	C47
	19(?)	14	38	Journigan's group, adit	qtz vein	3 x 30			(?)	Au--Cu	C47
	approx.	14 & 15	38	Vega (Gold Standard), 4 adits, open cut	two qtz veins	x 2100	qtz monz.		some	3 Au, 58 Ag, 11 Cu--Pb, Zn	C47
		15	38	Casey mine (see 15-37)					(?)	(?)	C34
		15	38	Ironsides group (see 14, 15-37)							C34
	approx.	15	38	Bananca, 250' adit, etc.	veins				(?)	(?)	SM12
	NE¼NW¼ 3	15	38	Big Silver (Essex), adits	veins, repl.		q.di/ls	1928	some	30-66 Ag, 2-9 Pb--Cu, Au	C53
	SW¼SW¼ 9	15	38	Trepier mine, open pit					(?)	(?)	quad. map
	15 and(?) 13	15 16	38 38	North Star, shafts, cuts	qtz veins	2-6 x	granite		(?)	Pb, Cu--Au, Ag	C53
7	SE¼ 35, SW¼ 36	15	38	White Mountain (Bonham Talc) cuts, about 40 adits, 30 acres	meta		dolo., ls, qtzite	(?)1950-57	>25,000 tons	Talc (steatite)	CSR8, C47 C176, PP408
7	SE 36 NE 1 NW 6	15 16 16	38 38 39	White Mountain (Florence) cuts, adits, shafts-½ x 1/10 mi	meta		dolo., ls, qtzite	1938-59	>8,000 tons	Talc (steatite)	CSR8, C47 C176, PP408
		16	38	Badgette - Lafayette					(?)	Ag, Pb(?)	C34
	approx.	16	38	Farrington (see 1, 2, 14-40)				1913-14	(?)	43 Pb, 31 Ag--Cu, Au	C144, C53
		16	38	Golden Reef				1937(?)	small	Au, Cu	C144
	approx.	16	38	Gordon				1913	some	24 Pb, 29 Ag--Cu, Au	C53
	approx.	16	38	Hall				1918	some	13 Pb, 21 Ag--0.05 Au	C53
	approx.	16	38	Inden Lead & Silver Mng. Co.				1918	some	23 Pb, 25 Ag--Cu, Au	C53
		16	38	New Enterprise					none		C53
	approx.	16	38	Givens					moderate	Au, Ag, Cu--Pb	C53
	approx.	16	38	Irwin				1909	some	38 Pb, 6 Cu, 8 Ag--Au	C53
	approx.	16	38	Lost Frenchman				1911	small	32 Pb, 28 Ag, 2 Cu--0.1 Au	C53
	approx.	16	38	Lucky Strike				1951	small lot	20 Pb, 4 Ag	C53
	approx.	16	38	Reid						Pb, Ag, Au	C53
	approx.	16	38	Robin Hood				1913	1 shipment	39 Pb, 33 Ag--Au, Cu	C53

REPORTED OCCURRENCES OF SELECTED MINERALS—Continued

Index No. MDLU map	Location-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit Type	Size (feet) Thick x long	Host rock	Production and [Reserves, date] Year	Amount	Commodity (Cu, Pb, Zn in percent; Au, Ag in oz per ton) Main--other	Reference
		16	38	Santa Maria					(?)	Ag, Pb(?)	C53
	approx.	16	38	Schaffer				1911-18	some	62 Pb, 77 Ag, 6 Cu, high Au	C53
	approx.	16	38	Sure Contest				1937	some	10 Pb, 7 Ag--Cu	C53
	approx.	16	38	Townsend				1910-12	small	30 Pb, 39 Ag, 3 Cu--0.01 Au	C53
	approx.	16	38	Wiggington				1918	small	12 Pb, 14 Ag--Cu, Au	C53
	approx.	16	38	Warnken(?)				1943-45	some	6 Pb, 10 Ag--Cu	C53
	approx.	16	38	McIlroy & Sons slate	N. 30 W. beds					slate (flagstones, roof granules)	C34
	1	16	38	Alvah						Ag, Pb(?)	C53
	1(?)	16	38	Mass					(?)	Talc (steatite?)	C176
	1	16	38	White Mtn. (Florence) see 36, 15-38							
	1 or 2	16	38	Alberta, incl. sh., drifts, stopes				1949-54	some	Talc (steatite)	C47
	1, 2, 12-14, 23, 24, 30	16	38	many shafts, adits, pits					from many	(?)	quad. map
	1 or 12	16	38	Branson (Holliday?)					(?)	Talc (steatite)	C176
	2	16	38	Auguste (August)					(?)	Au	C47
	SW¼ 7	16	38	Flagstaff						(?)	PP408
8	11, 12, 13, 14	16	38	Royal group (Cerro Gordo Ext., Spear, Silver Spear) 200' shaft	3 veins	1-3 x	ls	to 1940	$30,000	Pb, Zn, Ag--Cu, Ag	C53, PP408
	12(?)	16	38	Skinner					(?)	Talc (steatite?)	C176
	12, 13	16	38	Hart (Cerro Gordo Ext., Lead Queen)	vein	1½ x		1936	40 tons	15 Ag, 20 Pb, 3 Zn--Au, Cu	PP408
8	12, 13, 23, 24	16	38	Cerro Gordo (incl. Aries), 30 mi. underground workings	fissures		marble	Total post-1906	>$17 million >$6 million	Pb, Ag, Zn, Cu--Cd(?)	C53, C176 PP408, MR39
	13	16	38	Baushey (Bonshay)					(?)	Ag	C34
	13	16	38	Ella group, two adits	repl.		ls	1910-58	some	35 Cu, 32 Ag, 10 Pb--1 Zn, Au	C53, PP408
8	SE¼ 13 et al	16	38	Cerro Gordo mine, quarry	sed.		ls	(?)	some	ls, dolo. [large, 1963]	PP408, p. 6
	14	16	38	Mayflower group, 40' shaft, adits				(?)	1 shipment	22 Pb, 46 Ag--Cu	C53, C144
	SW¼ 14	16	38	Peterson, also KE Tunnel			ls			Ag, Pb(?)	PP408
	14, NE¼ 23	16	38	Ventura (Silver Reef, Sunset) shaft, adits, 1000' DD holes				pre-1949 1949	$100,000	Pb, Ag, Zn	C53, MR39 PP408
	15	16	38	Swansea Chief, two 150' shafts	fissure		ls	1912		12 Pb, 6 Ag—Au	C53
	19(?)	16	38	Lakeview, 40' sh., levels, 2 stopes	lenses		ls/qtzite	(?)	2,000± tons	Talc (steatite?)	CSR8, C47
	19, 30, 31	16	38	Inyo Marble Co. See 4, 16-37							
	23 or 24	16	38	Ventura (same as 23, 16-38?)						Pb, Ag(?)	C34

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Index No. MDLU map	Location—MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit Type	Size (feet) Thick x long	Host rock	Production and [Reserves, date] Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
	23 or 24(?)	16	38	San Benito					(?)	Pb, Ag(?)	C34
9	S½ 23, 24, N½ 26	16	38	Estelle & Morning Star (Riff Raff, Sure Contest, Troegers), 18,027' wkgs.				1916-37	large	Pb, Ag, Zn--Cu, Au	C53, PP408 C144, MR39
	24(?)	16	38	Occident (same as Estelle?)					(?)		C34
	NW¼ 24	16	38	Ignacio, 4,000' adits, glory hole					some	Ag, Pb (orig. discovery)	PP408
		11	39	none							
		12	39	none							
	9	13	39	Saline Valley	bedded			as of 1962	none	20-30 % Mn, 0.6 WO_3—calcite	C47, EG58-1
	E½ 18	13	39	Lower Warm Spring, Palm Spring	cones		travertine			Mn(?)	EG58-1, GQ612
		14	39	none							
	approx.	15	39	Valentine group, outcrops	veins		gr/ls		none	2-16 Cu, 9-14 Ag--Au	C50, C144
	approx. 27	15	39	outcrop	contact		q.m./skarn			Wollastonite, stilbite	CSR42
	SW¼SW¼ 29	15	39	prospect					(?)	(?)	quad. map
		16	39	Chloride-Bromide group					(?)	Ag, Pb(?)	C34
	approx.	16	39	Gehrig					small	Au, Ag, Cu	C144
	approx.	16	39	Bean-Smith (Royal Group?)				1909	small	32 Pb, 7 Ag, 6 Cu--0.06 Au	C53
	approx.	16	39	Berry Hill (Swansea Chief?)				1911, 1918	(?)	26 Pb, 15 Ag--0.01 Au, Cu	C53, C144
	approx.	16	39	Lookout No. 1, 25' sh., 15' wze				1919	small	30 Pb, 28 Ag, 1 Cu--0.02 Au	C53
	approx.	16	39	McDonald				1918	(?)	23 Pb, 38 Ag, 3 Cu	C53
	approx.	16	39	Staats				1911	small	42 Pb, 35 Ag	C53
	approx.	16	39	Sterling Queen				1938 1939	1 shipment cyanided	9 Pb, 6 Ag, 0.1 Au	C53
	approx.	16	39	Stockton				1918	some	21 Pb, 14 Ag--Au	C53
	approx.	16	39	Tullos				1911	1 shipment	18 Pb, 69 Ag	C53
	approx.	16	39	Western Metals (Ingomar)				1918	some	42 Zn	C53
10	approx. 4	16	39	outcrop (most accessible)			Rest Spr. Shale		none	chiastolite [occurs widely, 1962]	CSR42
	6	16	39	White Mtn. (Florence) see 36, 15-38						Talc	
	6, 7, 18, 19, 20	16	39	prospects, adits					some	(?)	quad. map
	7	16	39	(?)						Talc	BLM rept.
	18	16	39	San Lucas (Sam Lucas, Perserverence)	vein	4-6 x	ls	1915-18		3 Cu, 17 Ag--0.6 Pb, 0.03 Au	C53
	18	16	39	See 12, 13, 23, 24, 16-38						Pb, Ag, Zn	
	19	16	39	Newsboy	qtz. veins		ls	1913		17 Pb, 74 Ag, 3 Cu, 0.5 Au	C53, PP408

REPORTED OCCURRENCES OF SELECTED MINERALS—Continued

Index No. MDLU map	Location-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit Type	Size (feet) Thick x long	Host rock	Production and [Reserves, date] Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
	19(?)	16	39	Wittikint (Belmont?)					none(?)	Pb, Ag(?)	C34
11	NE¼ 19, NW¼ 20	16	39	Belmont, 50' shaft, 3,600' workings	qtz veins	1-6 x	granitic	pre-1938	$500,000	Ag, Pb, Cu	C53, PP408
		11	40	none							
		12	40	none							
		13	40	none							
	NE¼NW¼ 1	14	40	Copper Belle	contact		ig./marble	1918	15,000 lb	Cu	CSR42, C34
	SW¼ 1, SE¼ 2	14	40	Ubehebe (Farrington, Waterson, Butte) adits, open cuts				1908-51	2,940 tons	20 Pb, 13 Zn, 5 Ag--U	CSR42, 49
	1, 2, 12, 22, 23, 25, 26	14	40	adits, prospects					some(?)	Cu(?), Pb, Ag(?)	quad. map
	SE¼ 22	14	40	Blue Jay, Copper Queen, adits, shaft, trenches			tactite	1915	20 tons	4,000 lb Cu, 1,199 oz Ag	CSR42, C144
	approx. 22	14	40	Maries group					none(?)	Cu	C30, p. 300
	22, 23, 26(?)	14	40	Sanger group, prospects					none	Cu	CSR42, C50
	SW¼ 25	14	40	Star, prospect		60 x 800			none	Cu	C47, C144
	NW¼NE¼ 26	14	40	Copper Queen No. 1, 35' shaft	cont. meta.	50 x					CSR42
	NE¼SE¼ 10	15	40	Bonanza (Hesson, Clipper), 65' adit, 30' shaft	cont. meta.		ls		few tons(?)	2 Cu--Au, Ag, Pb, 0.016 eU	CSR49, C47
	11	15	40	Inyo Copper Mining & Smelter Co.			ls, qtzite		none	4-41 Cu--Au, Ag	CSR42
	NE¼NW¼ 12	15	40	Copper King (Copper Giant No. 3), adits, drifts	contact	1 x	ig./marble		little(?)	Cu	CSR42, C47
	12(?)	15	40	Roberts & Derat, outcrop					none(?)	Cu	C50
	13	15	40	Wedding Stake (and Red Bear?)	veins		ls			35 Cu, 103 Ag, Pb--Au	C50, CSR42
12	SW¼ 13	15	40	Lippincott (Lead King) 625' adit	vns-repl.		dolo. marble		2,000 tons	25-40 Pb, 11-38 Ag, 4-11 Zn--Cu, U	CSR49, C47
	Cen. 13	15	40	Homestake, pits, trenches					none(?)	Talc	CSR42, C176
	14(?)	15	40	Raven, 2,000' workings			ls		some	Zn, Pb, Ag	CSR42, C53
	SE¼ 14(?)	15	40	outcrop	vein	1 x 25	q.m.			Barite--qtz, FeO_x	CSR42
	36(?)	15	40	outcrop	pegmatite					Mo, W--magnetite	CSR42
	SE¼ 36	15	40	Dodd's Springs-Trail	vein	5-15 x 1800			none	Cu (malachite)	C47, C144
	NE¼NW¼ 1	16	40	Shirley Ann (Eureka?) 200' wkgs			marble			Cu, Pb	CSR42
	1	16	40	Navajo Chief	vein	50 x 1000	ls/gr			Cu--Au, Ag	C47, C144
	1	16	40	Eureka, 80' sh., 100' drifts		5 x 150			none	Cu--Pb	C50

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Index No. MDLU map	Location-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit Type	Size (feet) Thick x long	Host rock	Production and [Reserves, date] Year	Amount	Commodity (Cu, Pb, Zn in percent; Au, Ag in oz per ton) Main--other	Reference
	1 or 2(?)	16	40	Scott and Titus					none	Au, Ag, Pb--Cu	C50
	NE¼SW¼ 6	16	40	Anton and Pobst (Inyo), 100' wkgs				1916	400 tons	10 Cu	C144,CSR42
	SE¼SW¼ 6	16	40	May B, shallow workings	vein					Pb, Cu	CSR42
	6(?)	16	40	Rambler No. II	vein		shale		none(?)	Cu--Pb	CSR42
	6, 7, 17, 18, 20	16	40	adits - see other listings					(?)	Cu	quad. map
	7	16	40	adit - see other listings					(?)	Pb, Ag	quad. map
	NW¼SE¼ 7	16	40	Cerussite	vein		ls	1954	small	Pb, Ag ($12-$25)	CSR42,C47
	SE¼NW¼ 7	16	40	Pinion Ext. and Green Eye	fractures		q.m.			Cu stain	CSR42
	approx. 12	16	40	Twin Sisters			quartz		none(?)	Cu	CSR42
	SE¼SW¼ 17, 20	16	40	Copper Queen - Lucky Boy	qtz. vein		q.m.			Cu	CSR42
	NW¼NE¼ 18	16	40	adits (75', 90'), open cuts	tactite		marble/q.m.			Cu stain	CSR42
		15	41	Contact mines (Lippincott?)					(?)	(?)	C34,CSR42
		15	41	Overlook group					(?)	(?)	C34
	NW¼ 5	15	41	Sally Ann (Copper Knife) 80' adit	tactite		ls Lost Burro Fm.	1902-51	none	Cu	CSR42
13	SW¼ 14(?)	15	41	Ubehebe (Stone Pencil), adits			ls, dolo.	pre-1945-59	some	Talc (steatite) [substantial, 1959]	C47,C176
	Btwn Dodds Sprg. & Racetrack 16	15	41	Butte, 600' adit	oxidized			1927-30		56 Pb, 15 Ag (19 Cu)--Au	C53,C144
	SW¼NE¼ 17	15	41	Ulida (Walker), two adits	veins		gr/ls		none	Cu--Au, Ag	CSR42,C47
	18	15	41	Settle Up					none(?)	Cu	C47
	20, 21	15	41	Alvord group	contact	10 x 300	gr/ls		none	W	C47
	21	15	41	Shamrock, 25' incline	cont. meta.		q.m./marble		none(?)	Cu	CSR42
	NW¼ 23(?)	15	41	Keeler (White Horse?)						Talc	C176,C47
	SW¼SW¼ 30	15	41	Cuprotungstite (Alvord?) 20' open cut		½ x 1				W--Cu	CSR42
	31	15	41	outcrop	veinlets		q.m.			Cu--tourmaline	CSR42
	S½ cor. NW¼ 33	15	41	Monarch, 50' sh., 100' drifts	vein		granite	1915	small	W (huebnerite)	CSR42
	21	16	41	Hourglass, outcrop	veinlets		pegmatite		none(?)	Cu--Th(?)	CSR42

REPORTED OCCURRENCES OF SELECTED MINERALS--Continued

Index No. MDLU map	Location-MDBM Sec.	T. S.	R. E.	Name(s) and/or type of working	Mineral deposit Type	Size(feet) Thickxlong	Host rock	Production and [Reserves, date] Year	Amount	Commodity Cu, Pb, Zn in percent Au, Ag in oz per ton Main--other	Reference
				ADDENDA							
	approx. 21	14	38	Hunter Spring	water residue				none	0.8% Li	TP2916
	28	14	38	Vega Spring	water residue				none	1.2% Li	TP2916
	approx. 8	14	39	Sample 4	brine residue				none	0.2% Li	TP2916
	approx. 17	14	39	Sample 11	brine residue				none	0.4% Li	TP2916
	21	14	39	Samples 46, 47	brine residue				none	0.1%, 0.2% W	TP2916
	32	14	39	Sample 43	brine residue				none	0.2% W	TP2916
		14	38, 39	"On the playa"	evaporite				none	Na_2SO_4 [700,000± t, 1963]	TP2916
	approx.	14	38, 39	"In Saline Valley"	evaporite			1883-1907	some	Borax	TP2916, C176
		14	38	Saline Valley	evaporite			1911-1954	>2,000 t.	Salt	C176

Reported Occurrences of Selected Minerals

ABBREVIATIONS FOR REFERENCES

C30	California State Mining Bur. Bull. 30, 1904
C34	California State Mining Bur. Bull. 34, 1903
C47	California Jour. Mines and Geology, v. 47, no. 1, 1951
C50	California State Mining Bur. Bull. 50, 1908
C53	California Jour. Mines and Geology, v. 53, 1957
C144	California Div. Mines Bull. 144, 1948
C176	California Div. Mines and Geology Bull. 176, 1957
C194	California Div. Mines and Geology Bull. 194, 1973
CSR8	California Div. Mines Spec. Rept. 8, 1951
CSR42	California Div. Mines Spec. Rept. 42, 1955
CSR49	California Div. Mines Spec. Rept. 49, 1956
EG58-1	Economic Geology, v. 58, no. 1, January-February 1963
GQ612	U.S. Geol. Survey Geologic Quadrangle map
IC8158	U.S. Bur. Mines Information Circular 8158, 1963
MR39	U.S. Geol. Survey Mineral Investigations Resource map, 1964
MW	Mining World, October 1960
MY1964	U.S. Bur. Mines Minerals Yearbook, 1964
PP110	U.S. Geol. Survey Prof. Paper 110, 1918
PP408	U.S. Geol. Survey Prof. Paper 408, 1963
quad. map	U.S. Geol. Survey Topographic map, 15-minute series
RI6013	U.S. Bur. Mines Report of Investigations 6013, 1962
SM12	Report of the State Mineralogist [California], 1894-95
SM15	Report of the State Mineralogist [California], 1915-16
TP2916	Technical Publication, Naval Ordinance Test Station, China Lake, Calif.

Reported Occurrences of Selected Minerals

INDEX TO NUMBERED DEPOSITS

Death Valley sheet

Index No. 2° sheet	Page no. in table
1	3
2	3a
3	3a
4	3a
5	3a
6	3b
7	3b
8	3c
9	3d
10	3d
11	3e
12	3e
13	3f

(p. 4 follows)

Distribution

Bureau of Land Management c/o Jean D. Juilland, geologist
California Desert Plan Program
1695 Spruce Street
Riverside, CA 92507

1 - Transparent positive geologic map (pl. 1)
1 - Colored print of geologic map (scale 1:62,500)
1 - Copy of report (50 p.)

George W. Walker, Chief, Branch of Western Mineral Resources

1 - Colored print of geologic map
1 - Copy of report

J. P. Calzia, Conservation Division

1 - Uncolored print of geologic map
1 - Copy of report

R. M. Smith

1 - Negative of geologic map (scale 1:125,000)
1 - Uncolored print of geologic map
1 - Copy of report (original)
1 - Extra copy of report

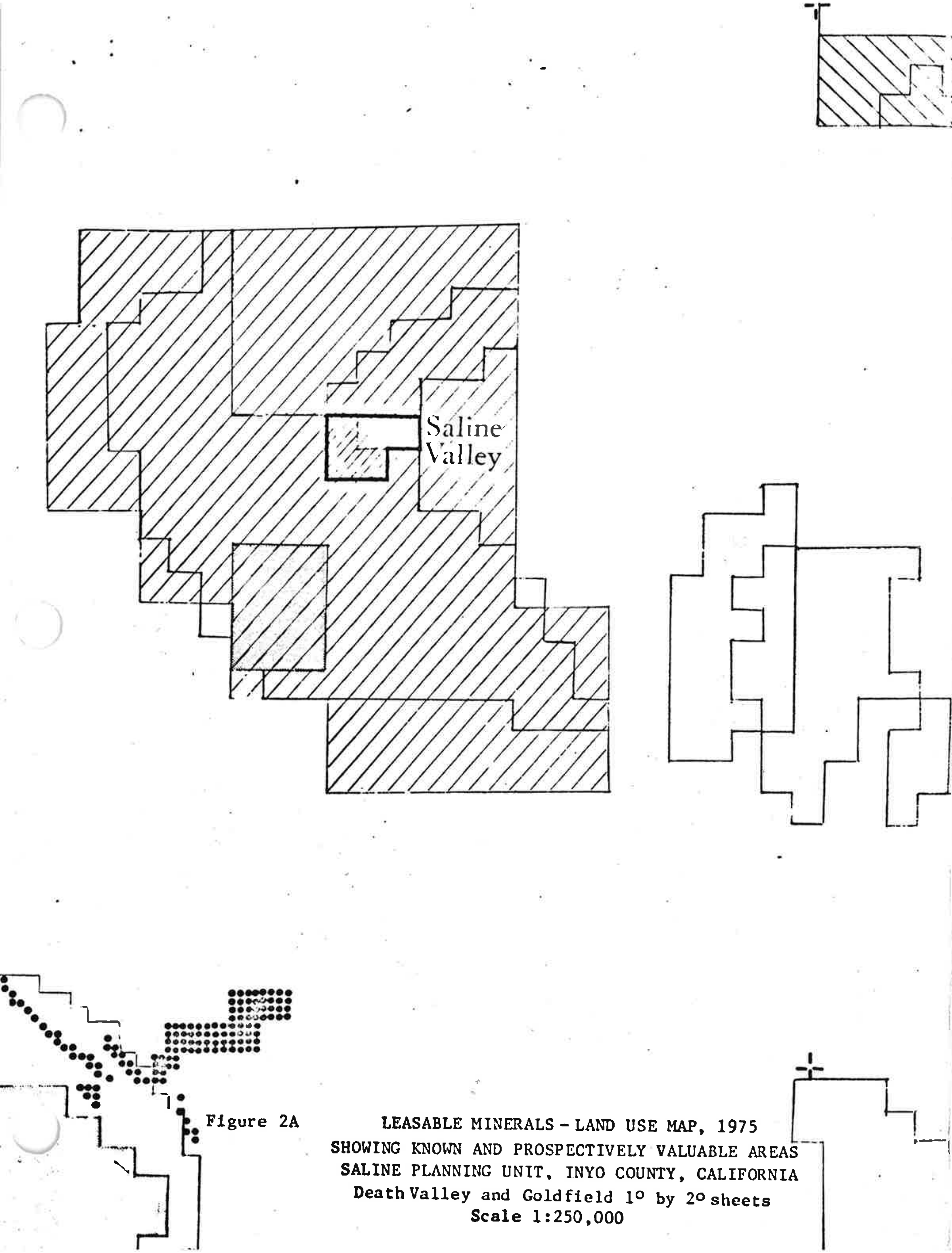


Figure 2A

LEASABLE MINERALS - LAND USE MAP, 1975
SHOWING KNOWN AND PROSPECTIVELY VALUABLE AREAS
SALINE PLANNING UNIT, INYO COUNTY, CALIFORNIA
Death Valley and Goldfield 1° by 2° sheets
Scale 1:250,000

EXPLANATION

Mineral Deposits - Land Use Map Showing Exploration Potential[1/]

(Size in millions: A, >$1,000; B, $1 - $1,000; C, <$1)

Area Class

1 - **Producing area; continued exploration**

- 1A - Large deposits known or probable
- 1B - Medium deposits known or probable
- 1C - Small deposits known or probable

2 - Known deposits inactive or depleted; **intermittent exploration**[2/]

- 2A - Large deposits known or possible
- 2B - Medium deposits known or possible
- 2C - Small deposits known or possible

3 - Favorable geologic setting; mineral **potential indicated;** exploration probable[3/]

4 - Favorable geologic setting; little or no indication of mineralization; exploration possible[4/]

5 - Unfavorable geologic setting; exploration unlikely[5/]

D - Covered area; bedrock of varied mineral potential; **intermittent** prospecting; exploration possible[D/]

Location (to nearest section within a township)

● - Production. Numbered deposits have significant production, reserves, or potential; see table

o - No known production. Numbered deposits have significant potential; see table

Δ - Commodity unknown

The Area Class of each outlined area is likely to remain fairly stable for several years or decades. An area class could be raised by new discoveries, but it is unlikely to be lowered since it is based on known deposits and on production records for more than 100 years. Because the exploration potential is not necessarily proportional to future discovery ratios, it is only a rough guide to production potential.

[1/] Excludes leasable minerals (fuels, salines, phosphates) and geothermal resources. Lands of known value and of prospective value for these resources are classified by the Conservation Division, U.S. Geological Survey and are shown on separate overlays prepared by Conservation Division. All other (locatable) minerals are included on the MDLU map. The inferred exploration potential of an area (Area Class) is judged by the size, type, and number of known deposits. The extent of each area is determined by extrapolating into localities of equivalent host rock without regard for accessibility or present restrictions on land use.

[2/] No known reserves of ore at current prices. Reserves of lower grade are known and (or) undiscovered ore bodies near depleted deposits are suspected. Periodic re-examination; exploration during times of high prices.

[3/] Favorable host rock, undeveloped prospects, and (or) untested geophysical-geochemical anomalies indicate a mineral potential of unknown magnitude. Exploration probable during times of high prices.

[4/] Exploration depends upon indications, if any, that may or may not be detected by use of new prospecting concepts, methods, or tools.

[5/] The only localities in Class 5 are those that have been unsuccessfully explored for commodities in current demand. Since all rock types of all ages are somewhere on earth host to valuable mineral deposits, and since exploration is rarely so exhaustive that all possibilities are eliminated, Class 5 localities are subject to revision.

[D/] Quaternary deposits of sand, gravel, common clay, and riprap are generally obtainable near place of use. Covered areas are not subdivided except for localities containing large or uncommon deposits. As most of the metalliferous ores were deposited before the valleys were formed, it is possible that the parts of the bedrock formations beneath the valley fill and Quaternary volcanic rock contain about the same proportion of ore deposits as the parts exposed in the mountain ranges. Prospecting in areas of relatively thin cover is feasible by geophysical, geochemical, and remote-sensing techniques.

This map is preliminary and has not been edited or reviewed for conformity with Geological Survey standards

Compiled by Roscoe M. Smith, February 1976

Figure 2

MINERAL DEPOSITS - LAND USE MAP, 1951-1966
SHOWING EXPLORATION POTENTIAL
SALINE PLANNING UNIT, INYO COUNTY, CALIFORNIA
Death Valley and Goldfield 1° by 2° sheets
Scale 1:250,000

EXPLANATION

Leasable minerals - land use map

SALINE PLANNING UNIT, INYO COUNTY, CALIFORNIA

WATER RESOURCES

Lands classified or withdrawn for waterpower or reservoir sites

KNOWN LEASING AREAS

Known geologic structure for oil and gas

Known geothermal resources area (KGRA)

Known leasing area for sodium and potassium

LANDS VALUABLE PROSPECTIVELY

Oil and gas

Geothermal resources

Sodium and potassium

This map is preliminary and has not been edited or reviewed for conformity with Geological Survey standards

Compiled by James P. Calzia, 1975

(p. 5 follows)

GEOLOGIC MAPS

SALINE PLANNING UNIT
Inyo County, California

Index No. on Figure 1	15' Quadrangle	Geologic map		
		Scale	Author	Publication
1	Waucoba Spring	1:125,000	Ross, 1967	USGS I-506
		1:62,500	Nelson, 1971	USGS GQ-921
		1:250,000	Calif. State map	Mariposa sheet
2	Last Chance Range	1:125,000	Ross, 1967	USGS I-506
			Stewart & Troxel	Unpublished
		1:250,000	Calif. State map	Mariposa sheet
3	Waucoba Wash	1:125,000	Ross, 1967	USGS I-506
		1:62,500	Ross, 1967	USGS GQ-612
		1:125,000	Ross, 1970	USGS PP 614-D
		1:250,000	Calif. State map	Death Valley sheet
4	Dry Mountain	1:125,000	Ross, 1967	USGS I-506
		1:62,500	Burchfiel, 1969	CDM&G SR-99
		1:250,000	Calif. State map	Death Valley sheet
5	New York Butte	1:125,000	Ross, 1967	USGS I-506
	(N. half)		Smith, W. C.	Unpublished
	(S. half)	1:62,500	Merriam, 1963	USGS PP 408
	(S. half)		Smith, W. C.	Unpublished
		1:250,000	Calif. State map	Death Valley sheet
6	Ubehebe Peak	1:125,000	Ross, 1967	USGS I-506
		1:62,500	McAllister, 1956	USGS GQ-95
		1:250,000	Calif. State map	Death Valley sheet
7	Marble Canyon	1:250,000	Ball, 1907	USGS Bull. 308
		1:250,000	Calif. State map	Death Valley sheet

GEOPHYSICAL MAPS

Aeromagnetic map of southeastern California and southern Nevada: U.S. Geol. Survey open-file map 75-52, scale 1:250,000.

Zietz, Isadore, and Kirby, J. R., 1968, Magnetic map from 112° W. longitude to the coast of California: U.S. Geol. Survey Misc. Inv. Map I532-A, scale 1:1,000,000.

Chapman, R. H., Healey, D. L., and Troxel, D. W., 1971, Bouguer gravity map of California, Death Valley sheet: California Div. Mines and Geology, scale 1:250,000, text 8 p.

Mabey, D. R., 1963, Complete Bouguer anomaly map of the Death Valley region, California: U.S. Geol. Survey Geophys. Inv. Map GP-305, scale 1:250,000.

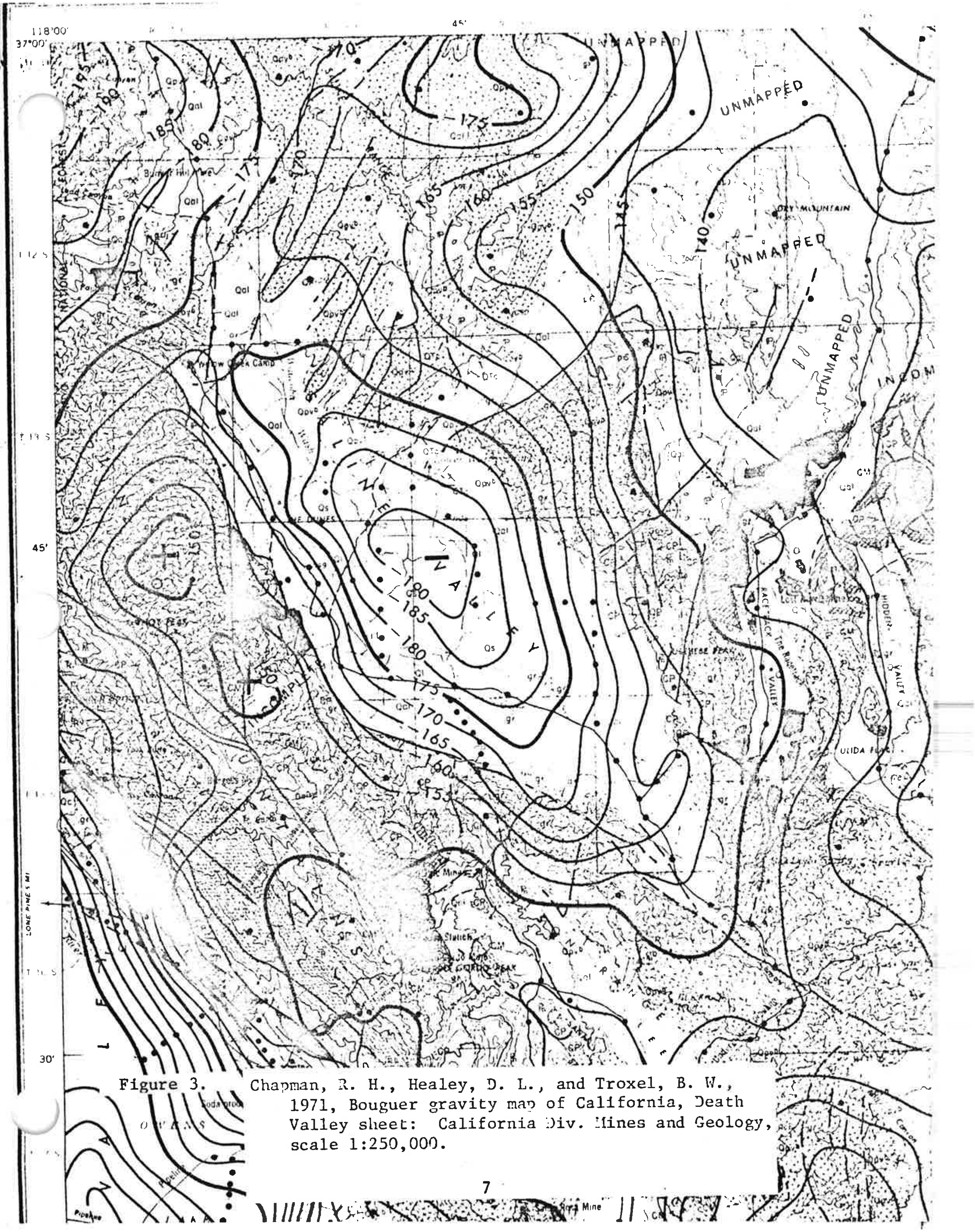


Figure 3. Chapman, R. H., Healey, D. L., and Troxel, B. W., 1971, Bouguer gravity map of California, Death Valley sheet: California Div. Mines and Geology, scale 1:250,000.

Saline Valley

Granitic rocks are exposed in a large area at the northern end of Panamint Valley in the vicinity of Hunter Mountain, but gravity values in this area show little exception to the northwest-dipping regional trend. Farther northwest, Saline Valley is marked by a very prominent northwest-trending gravity minimum. The local gravity relief in Saline Valley is probably more than 40 mgal. However, as pointed out by Mabey (1963), the gravity gradients that extend onto bedrock outcrops along the margins of the valley cannot be explained by low-density material underlying the valley. These gradients are observed over bedrock outcrops along the north side of the Nelson Range where Mabey (1963) estimated a northward decrease in the anomaly of about 15 mgal in 3½ miles and on the northeast side of Saline Valley where there is a westward decrease of about 14 mgal in 2 miles. Only a part of these decreases in anomaly values toward the north and west could be caused by steepening of the regional gravity gradients. One possible explanation is that Saline Valley is underlain principally by granitic rocks and that more dense metamorphic rocks are present in and underlying the Inyo Mountains, the Nelson Range, and the Panamint Range to the west, south, and northeast, respectively. Another possibility is that the Saline Valley area is underlain at depth by a large granitic intrusive mass with a lower density than that of the usual Mesozoic plutonic basement rocks.

Steep gravity gradients on the edges of and within Saline Valley on the west and south sides in particular suggest that multiple fault zones exist and are generally parallel both to the Inyo Mountains and the Nelson Range. There is not, however, positive gravity evidence for a fault on the Panamint Range side of the valley. On the basis of the gravity data, Mabey (1963) estimated a maximum thickness of about 3,000 feet of Cenozoic sedimentary rocks in the valley north of the dry lake.

A nose in the gravity contours extends westward from the positive gravity anomally associated with the Panamint Range into the southeastern part of the Saline Range, north of Saline Valley, where it is joined by a northward-trending positive anomaly from the Inyo Mountains. Much of the Saline Range is covered by Cenozoic basaltic volcanic rocks, but the presence of scattered outcrops of Paleozoic sedimentary rocks suggests that these rocks near the surface may be the chief cause of the positive gravity anomalies.

Panamint Range

The Panamint Range is marked by a broad north-northwest-trending positive anomaly that extends entirely across the Death Valley sheet. The anomaly decreases to the south and to the northwest from Tucki Mountain where the maximum gravity value of more than —85 mgals occurs. To the south, the anomaly is divided into two noses by a northwesterly trending low saddle northeast of Telescope Peak. The cause of this low saddle is not readily apparent. A zone of lower density rocks, possibly an extension of the granite of Hanaupah Canyon (Hunt and Mabey, 1966), may be the cause of this low saddle.

To the north, the Cottonwood Mountains segment of the Panamint Range is marked by a positive north-trending anomaly. The northward decrease in the regional gravity field is readily apparent.

The mass of Precambrian metamorphic rocks in the Panamint Range south of Tucki Mountain does not seem to be adequately reflected in the gravity data, thus suggesting either that this large mountain range is partly isostatically compensated as suggested by Mabey (1963) or that the metamorphic rocks in the range may overlie rocks of relatively low density beneath the range. West-dipping low-angle faults exposed in a few places along the east edge of the Panamint Range may indicate a major fault zone that separates the rocks in the Panamint Range from rocks beneath the range. The gravity data suggest that the rocks of the Panamint Range extend eastward beneath Death Valley and that no major faults offset Cenozoic rocks on the east side of this range.

Chapman, R. H., Healey, D. L., and Troxel, B. W., 1971, Bouguer gravity map of California, Death Valley sheet: California Div. Mines and Geology, 1:250,000 (text p. 6)

(p. 8 follows)

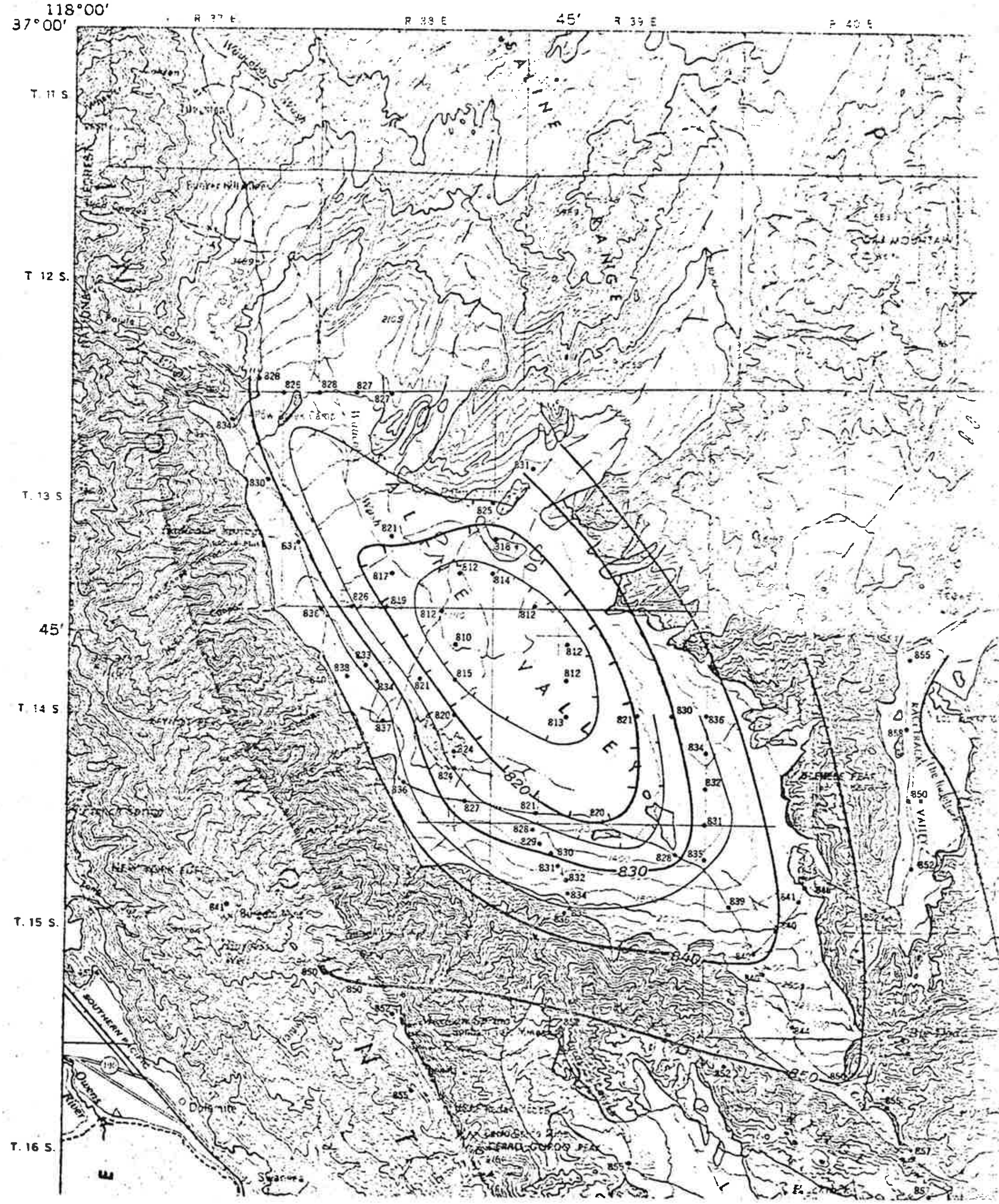


Figure 4. Mabey, D. R., 1963, Complete Bouguer anomaly map of the Death Valley region, California: U.S. Geol. Survey Geophys. Inv. map GP-305, scale 1:250,000.

SALINE VALLEY

The maximum gravity relief across Saline Valley is more than 40 mgals; however, the gravity gradients that extend onto the bedrock outcrops along the margins of Saline Valley cannot be explained by low-density material underlying the valley. This is particularly apparent along the north side of the Nelson Range where there is a northward decrease in the anomaly of about 15 mgals over a distance of about 3½ miles between stations on bedrock. This gradient is nearly normal to the westward increase in regional elevation and does not appear to be related to the regional or local topography.

The cause of this bedrock anomaly is not apparent from a consideration of the density of the surface rocks. The low gravity values occur over the large body of quartz monzonite that trends northwest from the Panamint Range across Saline Valley into the Inyo Mountains, and the higher values to the south are on Paleozoic sedimentary rock. The densities of the two rock types at the surface are about equal. The relatively low anomaly values over the intrusive body may result from the quartz monzonite replacing a more dense metamorphic basement complex at depth, or the sedimentary rock may occur in a large roof pendant, which, in the lower part contains a large volume of more dense metamorphic rocks.

The steep gravity gradient along the west side of Saline Valley at the base of the Inyo Mountains is probably a near-surface effect and indicates about 2,000 feet of Cenozoic fill underlying the valley near the range front. Only a few hundred feet of Cenozoic rocks are in contact with bedrock along the fault zone at the base of the Nelson range, but a local gravity gradient, probably produced by a fault within the basin, was observed about 2 miles north of the range. There is no gravity evidence of faulting at the Panamint Range but the steepening of gradient about 2 miles from the range front may be related to a fault in the valley.

The maximum thickness of Cenozoic rock in the valley occurs in the area north of the lake, where the fill is probably about 3,000 feet thick. The gravity data indicate that the rocks exposed along the axis of the valley are part of the basin fill.

Mabey, D. R., 1963, Complete Bouguer anomaly map of the Death Valley region, California: U.S. Geol. Survey Geophys. Inv. map GP-305.

(p. 9 follows)

AERIAL PHOTOGRAPHS

High altitude (U2) photographs

There are no U2 vertical photographs of the area within the Saline Planning Unit. Two flight lines, however, skirt the southwest corner of the area; left oblique photos from these lines may show much of the area.

Scales of vertical photos range from 1:32,500 to 1:1,000,000. The LUDA program uses 1:130,000.

Film or prints of U2 photos are available only from National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Mountain View, Calif. 94040. Telephone: (FTS) 8-448-6252.

Assistance in selecting the specific photos wanted is furnished by Map Sales Office, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94022. Telephone: (FTS) 8-467-2427.

ERTS photographs

Image size	Scale	Format	Price	Product code
29.2 in.	1:250,000	Black and white	$15.00	26
29.2 in.	1:250,000	False color	$40.00	66

Order forms for these and other Product Codes (smaller scale) are attached to this report (in pocket).

Low-altitude aerial photographs

U.S. Geological Survey Project CQ, 1946, scale 1:37,400

Row	Numbers
10	7 - 19
14	43 - 58
13	73 - 89 (dupl. row 13) 60 - 66, 141 - 150
9	40 - 53, 23 - 39
8	165 - 180, 154 - 160, 102 - 111, 40 - 44, 25 - 26

Prints from the negatives are available from the U.S. Geological Survey at the following locations:

Federal Building, Room 7638
300 N. Los Angeles Street
Los Angeles, CA 90012

State Office Building
107 S. Broadway
Los Angeles, CA 90012

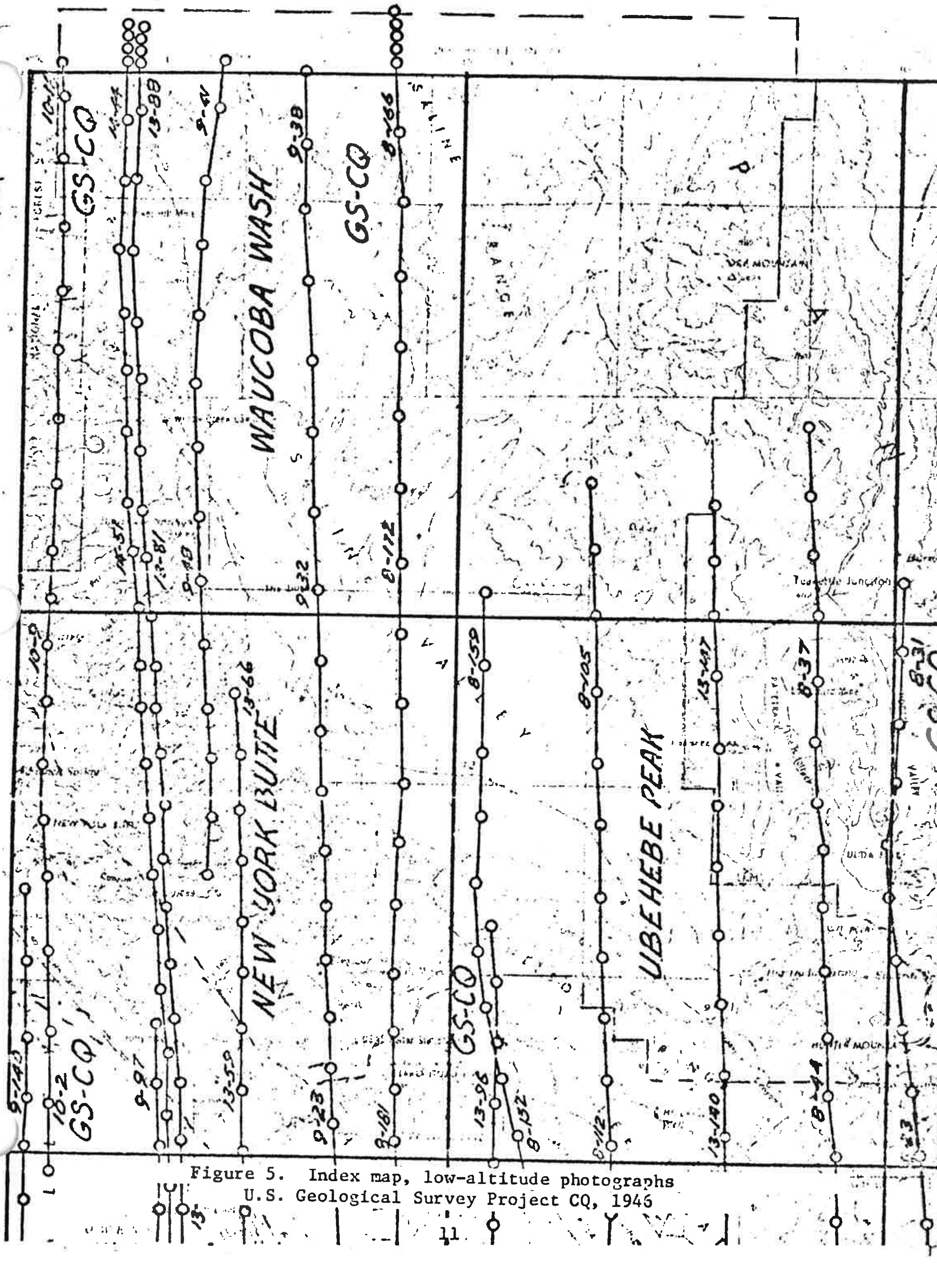


Figure 5. Index map, low-altitude photographs
U.S. Geological Survey Project CQ, 1946

GEOLOGICAL SETTING

Saline Valley is a deep depression resulting from complex faulting and tilting, most of which is Late Tertiary to recent. The surrounding uplifted areas expose a record of virtually continuous marine miogeosynclinal deposition during the Paleozoic era, followed by intense folding, thrusting, and uplifting, probably during the Early Mesozoic era. Massive intrusions of quartz monzonite in the Late Mesozoic era cut the older rocks and were, in turn, broken by Late Cenozoic strike slip and block faulting accompanied by volcanism. Faulting has continued to the present. Plates 1 and 2 show the geological structure of Saline Valley.

(NOTS TP 2916, p. 7)

ECONOMIC POTENTIALITIES

In prospecting for such metals as copper, lead, molybdenum, and tungsten, important guiding clues may be obtained from comprehensive analyses of brines along the margins of saline lakes.

The comparatively high concentrations of tungsten in Saline Valley brines suggest that terrestrial brines may become an important source of tungsten. The lower limit of mined tungsten ores in the United States (1953) is 0.25% tungstic oxide, which compares favorably with some tungsten concentrations on the margins of the Saline Valley playa; however, at present, there are serious problems that prevent the commercial extraction of tungsten from brine.

The locally high concentrations of borax and sodium carbonate are not of commercial importance because of lack of quantity. Borax has not been mined in Saline Valley since borax dropped from above $300 per ton in price.

Thenardite (anhydrous sodium sulfate) is present in commercial amounts, but would need some cleaning before being marketable. There appears to be between 400,000 and 1,000,000 tons of thenardite on the playa.

More prospecting for iodine should be done, as commercial deposits of iodine in the salt crust as well as in the brine appear to be probable.

(NOTS TP 2916, p. 39)

GENERAL GEOLOGY.

SUMMARY STATEMENT.

The White Mountain Range is built up of a thick series of sedimentary rocks, including bedded andesitic lavas, all of which are intruded by large masses of granite.

Sedimentary and igneous rocks occur in nearly equal volume and essentially form the bulk of the mountains. Locally, however, as on the west flank of the range, there are lake beds of early Pleisto-

cene or Pliocene age, and northwest of Deep Spring Valley and at the south end of the range, southeast of Keeler, basalt sheets attain considerable prominence.

The pre-Pliocene sedimentary formations range in age from Lower Cambrian to Triassic. They are composed largely of limestone, sandstone, and shale; limestones predominate, and, because limestones of like appearance recur in the successive formations, it is difficult to discriminate the formations. and reliance must be placed mainly on the evidence of their fossil contents. In mapping the sedimentary rocks five broad subdivisions were employed—Cambrian, Ordovician, Devonian, Carboniferous, and Triassic.

The rocks are faulted and greatly folded—in places overturned—and are much metamorphosed by extensive intrusions; consequently the stratigraphic relations as a rule are obscure. The volcanic rocks, already referred to as making up part of the stratigraphic sequence, form a prominent belt along the west flank of the southern part of the range. They are of Triassic age.

The intrusive igneous rocks are predominantly of granite character, ranging from diorite to granite. Hornblende-rich varieties verging toward hornblendite are found in the precipitous slopes of the range southeast of New York Butte. Dikes of diorite porphyry are of common occurrence in the sedimentary rocks surrounding the granitic masses; and in the foothills east of Keeler dikes of dense-grained siliceous rock (felsite) are common, generally lying parallel to the stratification of the inclosing rocks. (Knopf, Adolph, 1914, Mineral resources of the Inyo and White Mountains, Calif.: U.S. Geol. Survey Bull. 540, p. 84-85.)

ABSTRACT

More than 19,000 feet of Paleozoic rocks crop out in the Dry Mountain quadrangle. The lower 2,000 feet of section is composed of predominantly clastic quartzose sediments, whereas the remainder of the section is mostly limestone and dolomite with only three thin clastic formations intercalated—the Dunderberg Shale Member of the Nopah Formation (Upper Cambrian), the Eureka Quatzite (Ordovician), and the Rest Spring Shale (Mississippian ?). Cenozoic volcanic rocks, both basic (basalts) and felsic in composition, form extensive outcrops in the western and southern parts of the quadrangle.

Two east-directed thrust faults form the most important structural elements in the Dry Mountain quadrangle. A small part of the Racetrack thrust of McAllister (1952) is exposed in the southeast part of the area. Most of the Paleozoic rocks of the Saline Range are allochthonous and are part of a very extensive thrust plate that is exposed in northern Last Change Range, Saline Range, and eastern Inyo Mountains. Potassium-argon ages determined from quartz monzonite and syenite stocks, which cut these thrust plates, indicate the thrusting occurred prior to the Late Jurassic and after Early Permian time.

(SR99, p.v)

GEOLOGIC SETTING OF THE MINERAL DEPOSITS

The mineral deposits have yielded commercial quantities of lead, zinc, silver, gold, copper, and allegedly some tungsten but no nonmetallic commodity other than, perhaps, borax. Minor occurrences of talc and chrysotile asbestos are known, but they are not exploitable. The metalliferous deposits generally occur in the Paleozoic sedimentary rocks that range from Ordovician to Permian, near intrusive contacts of Mesozoic quartz-monzonite (fig. 3); but a few occur within the intrusive masses. These pre-Cenozoic rocks are exposed in about half of the area of the quadrangle (fig. 2). The other half of the area is covered with Quaternary and some possibly Upper Tertiary gravel, remnants of basalt flows, some lake sediments, and local veneers of wind-blown sediments. The Paleozoic rocks are folded, faulted, and at some places intensely deformed by intrusions, but only the most minor elements of structure, such as short faults and shattered zones, localized the metalliferous mineral deposits.

(SR42, p. 9)

OUTLOOK

The mines in the Ubehebe Peak quadrangle will probably continue to produce small quantities of metals from the lead-zinc-silver deposits and perhaps nothing from the gold, copper, and known tungsten deposits. New lead-zinc-silver ore bodies probably could be found by further exploration in the few mines that have produced these metals. The small outcrops of the deposits have been no indication of the size of the particular ore body, but rather have been a guide to areas for mining exploration. Beneath some outcrops of the ore deposits, the guiding stringers have been slight and the controlling structure obscure. Exploration thus far has been shallow, at most a few hundred feet below the surface. The practical question, whether undiscovered ore shoots can be found without excessive exploration, remains unanswered.

Further production of gold and copper, other than as a by-product, under present conditions seems unlikely. The richer parts of the deposits seem to be mined out, and the geologic basis for more exploration is discouraging.

Prospecting for new discoveries of ore deposits of the metals that have a long history of prospecting, such as gold, copper, silver, and lead, is not encouraging because the region was thoroughly covered by the early prospectors. The outlook is better for finding unlocated deposits of talc, chrysotile asbestos, and possibly radioactive minerals, but is better especially for finding tungsten. Prospecting for scheelite probably has been less thorough than for other kinds of metallic deposits, because the search for scheelite is much more recent, and scheelite is more difficult to detect except by means of ultraviolet light. An ultraviolet lamp obviously is difficult to use in rough and isolated country. Tactite, which is favorable for the occurrence of scheelite, as in the nearby Darwin district and the highly productive Bishop district, occurs widely in the Ubehebe Peak quadrangle, and moderately widespread traces of scheelite indicate that at least some tungsten here also was in the mineralizers. (CSR42, P. 31)

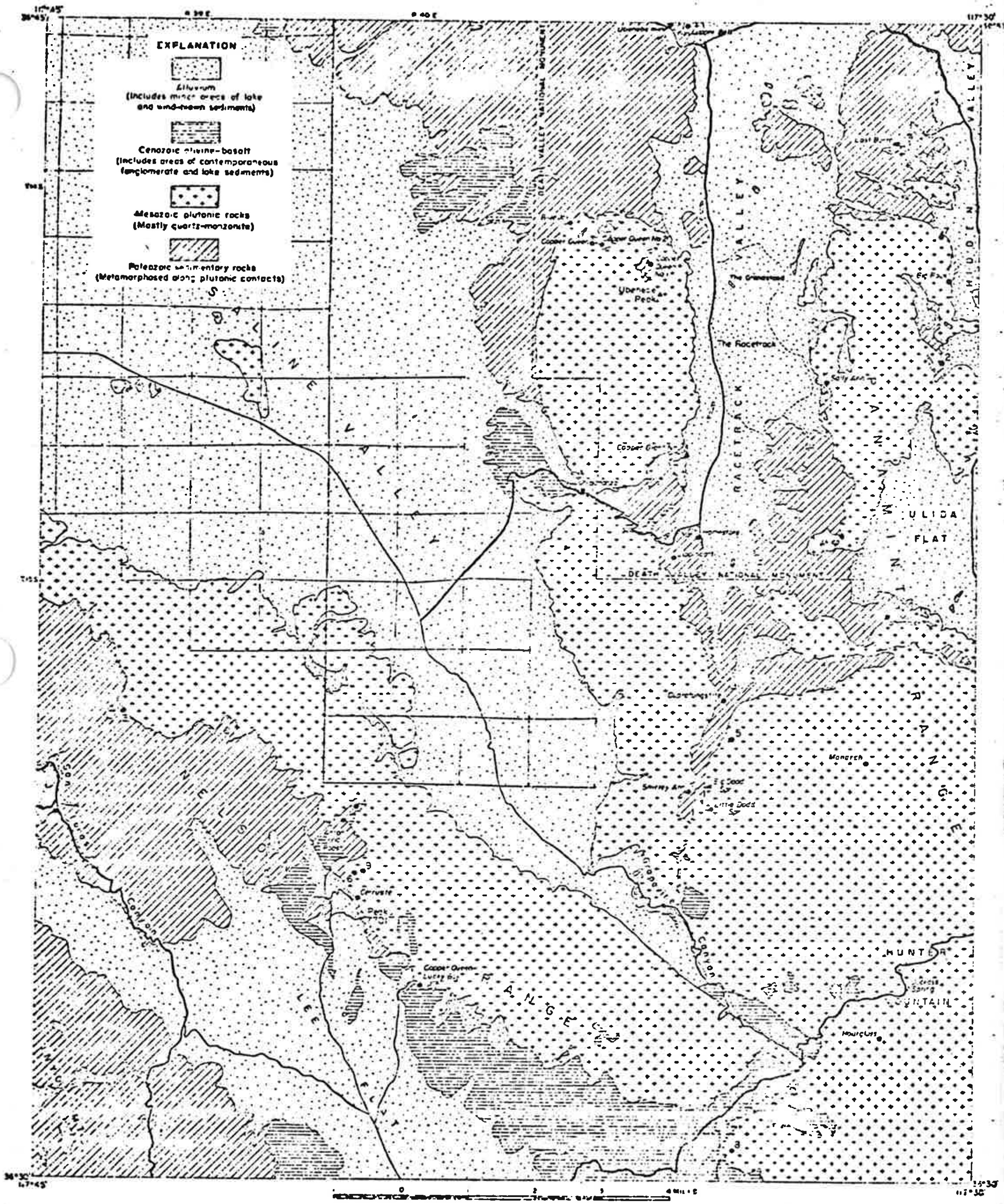


FIGURE 2. Simplified map of the Ubehebe Peak quadrangle, showing location of principal topographic features and generalized lithologic setting of mines, some prospects, and numbered mineral localities.

(p. 15 follows)

LAST CHANCE THRUST—A MAJOR FAULT IN THE EASTERN PART OF INYO COUNTY, CALIFORNIA

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Work done in cooperation with the California Division of Mines and Geology

Abstract.—The Last Chance thrust has been traced throughout an area of over 400 square miles in the eastern part of Inyo County, Calif., and probably extends in the subsurface under most of the northern Inyo Mountains and southern White Mountains. Late Precambrian, Cambrian, or Ordovician strata form the sole of the upper plate and are thrust over shaly Mississippian strata, and locally carbonate rocks of Silurian age. The strata in the upper plate generally dip eastward into the fault surface, exposing successively younger strata above the fault to the east. These spatial relations show that the upper plate moved east relative to the lower plate for a minimum distance of 20 miles.

A major fault, here called the Last Chance thrust, has been mapped in the eastern part of Inyo County, Calif. (fig. 1). This report describes the extent and the structural characteristics of the fault, and its relationship to other faults in the southern Great Basin. The report is based on detailed mapping in the Inyo Mountains, Dry Mountain area, and part of the Saline Range, and reconnaissance mapping elsewhere. Part of the area included in the study has been mapped by E. H. McKee, U.S. Geological Survey, and B. W. Troxel, California Division of Mines and Geology; permission to use their unpublished information is greatly appreciated.

The region in which the thrust fault occurs is characterized by high mountains and deep intermontane basins. The mountain areas are composed of sedimentary rocks of late Precambrian to Triassic age, granitic rocks of Mesozoic age, and sedimentary and volcanic rocks of Cenozoic age (Burchfiel, in press; McAllister, 1952, 1956; Nelson, 1962, 1963; Ross, 1965, and unpublished compilation of the Inyo Mountains region; and Stewart, 1965). The pre-Tertiary stratigraphic sequence is more than 40,000 feet thick (table 1). The rocks in some parts of the stratigraphic section change facies from the eastern to the western part of the region, and different stratigraphic names have been applied to correlative rocks in these two areas. These facies changes occur mostly within the rocks of the upper plate of the Last Chance thrust, and are not caused by telescoping of the stratigraphic section along the thrust.

The region is characterized by moderately to steeply dipping strata cut by many high-angle faults and a few low-angle thrust faults. Locally the rocks are closely folded, and some folds are overturned. Near intrusive contacts the sedimentary rocks are metamorphosed, sheared, and attenuated. The Death Valley–Furnace Creek fault zone, a major right-lateral strike-slip fault on which displacement may range from 30 to 50 miles (Stewart, in press), passes through the northeast part of the area.

DESCRIPTION OF THE THRUST

The Last Chance thrust underlies a large portion of the Inyo Mountains—Last Chance Range region (fig. 2), and has been traced throughout an area of more than 400 square miles. It crops out in the southern part of the Last Chance Range and in the Dry Mountain area, and in three windows to the west (Saline Range, Jackass Flats, and Eureka Valley windows). Although the thrust cannot be mapped continuously throughout the region, the stratigraphic and structural uniformity in the upper and lower plates suggests that

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[2] Rice University.

Table 1.—*Pre-Tertiary rocks in the Inyo Mountains–Last Chance Range region*

Age	Western part	Thickness (Feet)	Eastern part	Thickness (Feet)
TRIASSIC AND JURASSIC(?)	Volcanic rocks	2200		
	Marine rocks	1800		
TRIASSIC	UNCONFORMITY		(Top not exposed)	
PERMIAN	Owens Valley Formation	1800	Owens Valley Formation	3000±
PENNSYLVANIAN	Keeler Canyon Formation	2200±	Keeler Canyon Formation	3900
	Rest Spring Shale	2500	Rest Spring Shale	300?
MISSISSIPPIAN	Perdido Formation	300-600	Perdido Formation	610
	UNCONFORMITY		Tin Mountain Limestone	475
DEVONIAN			Lost Burro Formation	1525
SILURIAN	Vaughn Gulch Limestone and Sunday Canyon Formation	700-1500	Hidden Valley Dolomite	1365
ORDOVICIAN	Ely Springs Dolomite	200-500	Ely Springs Dolomite	940
	Johnson Spring Formation	100-400	Eureka Quartzite	400
	Barrel Spring Formation	100-200		
	Mazourka Group	1000	Pogonip Group	1440
CAMBRIAN	Tamarack Canyon Dolomite	900	Nopah Formation	1600
	Lead Gulch Formation	300		
	Bonanza King Dolomite	2800	Bonanza King Dolomite	3300
	Monola Formation	1250	Carrara Formation	1640
	Mule Spring Limestone	1000		
	Saline Valley Formation	850		
	Harkless Formation	2000	Zabriskie Quartzite	1360±
	Poleta Formation	1200	Wood Canyon Formation	1300+
PRECAMBRIAN	Campito Formation	3500	(Base not exposed)	
	Deep Spring Formation	1500		
	Reed Dolomite	2000		
	Wyman Formation (Base not exposed)	9000		

See Stewart, 1965, USGS nomenclature: U.S. Geol. Survey Bull. 1224-A, p. A60-A70.

Burchfiel, 1965, Geol. Soc. America Bull., v. 76, no. 2, p. 175-192.

For description of most formations see Burchfiel, 1969, Dry Mountain quadrangle: California Div. Mines Spec. Rept. 99.

(p. 16 follows)

GEOLOGY OF THE CERRO GORDO MINING DISTRICT, INYO COUNTY, CALIFORNIA

By C. W. Merriam

ABSTRACT

The Inyo Mountains near Cerro Gordo comprise strongly folded and faulted sedimentary rocks ranging in age from Ordovician to Middle Triassic. These were intruded by granitic bodies, aplite dikes, and by innumerable andesitic and dacitic dikes of later age. Though largely nonfoliated, the sedimentary rocks have undergone varying degrees of contact and hydrothermal metamorphism productive of hornfels, calc-hornfels, phyllite, and quartzite.

Tertiary basaltic rocks and tuffs cover older rocks at the southern tip of the range, but do not enter the area of the present map.

Paleozoic rocks of the Cerro Gordo area are more than 11,000 feet thick and include all systems from Ordovician through Permian. Mapped units which have wide distribution in the Great Basin are the Pogonip group, Eureka quartzite, and Ely Springs dolomite of the Ordovician and the Chainman shale of Mississippian age. Silurian and Devonian rocks are represented by the Hidden Valley dolomite and the Lost Burro formation, the former being largely Silurian, but embracing Lower Devonian strata at the top. The Lost Burro includes the *Stringocephalus* zone near the base and is of late Middle and Upper Devonian age. This unit is largely a nondolomitic marble in this area and is especially important as host rock of the principal ore bodies.

The Mississippian system is represented by two principal formations: Tin Mountain limestone below and Chainman shale above. A third unit, the Perdido formation, wedges in to the east between Tin Mountain and Chainman. Being less than 100 feet thick near Cerro Gordo, it has not been differentiated from the Chainman in mapping.

Pennsylvanian and Permian strata are divided into two formations: Keeler Canyon formation of Pennsylvanian to Early Permian age and Owens Valley formation of Permian age. These strata are predominantly impure carbonates, with subordinate shale, siltstone, sandstone, conglomerate and chert. Stratigraphic division of the Pennsylvanian and Permian was accomplished mainly by study of the abundant fusulinids.

Some 4,000 feet of Lower and Middle Triassic rocks are exposed on the west side of the Inyo Mountains. Of marine origin is the lower 1,800 feet which comprises shale, thinly-bedded limestone and thick-bedded lenticular reefy limestone. The upper part of the Triassic section comprises volcanic rocks and land-laid deposits in which reddish coloration is characteristic. The Triassic succession is incomplete, for on the west side of the Triassic belt the volcanic rocks are in fault contact with fusulinid-bearing Permian beds of the Owens Valley formation.

Intrusive rocks of the Cerro Gordo area include the older granitic and aplitic rocks of possible Cretaceous age and younger andesitic and dacitic porphyry dikes. The younger porphyry dikes occur in large numbers and for the greater part strike northwest. In the Cerro Gordo mine such dikes, in fractured condition, seem to have served as avenues of ascent for mineralizing solutions.

Rocks of the Cerro Gordo area are extensively folded and faulted. Most significant structural feature is the large asymmetrical south-plunging Cerro Gordo anticline which forms a sort of backbone to the Inyo Range. On its flanks and crest are irregular subsidiary flexures. Bordering the major anticline are many smaller folds with northwest axial trend. These range greatly in magnitude and tightness, partly in response to varying competency of strata involved. Some of the folds are related to reverse faults or thrusts. The Cerro Gordo mine is situated in the axial zone of the anticline which carries its name.

Faults having a northerly trend are characteristic of the region. Among these is the important Cerro Gordo fault, master fault of the Cerro Gordo mine. Northwestward-trending normal faults greatly complicate geologic structure in the Cerro Gordo mine, where certain of these offset ore bodies.

Silver, gold, lead, zinc, and in minor amounts copper are the metallic commodities of the Cerro Gordo area. The Cerro Gordo mine formed by consolidation of the Union mine, San Felipe, and the Santa Maria far exceeds in production all others of the area combined. Estimates of total Cerro Gordo mine production show about 4,400,000 ounces of silver, 37,000 tons of lead, and 12,000 tons of zinc from zinc carbonate ore. Year of peak production was 1874. More than half the lead and three-fourths of the silver were produced in the years 1869 through 1876.

Ores of the Cerro Gordo mine occur in Devonian marble of the Lost Burro formation on the east or footwall side of the northward-trending Cerro Gordo fault. This fault is seemingly normal and carries Chainman shale down on the west against marble of the Lost Burro formation. Largest ore bodies were found in two channels which rake steeply to the south, which is the plunge direction of the Cerro Gordo anticline. The two principal ore channels known as the Union chimney on the north and Jefferson chimney on the south occur in fractured marble close to the master Cerro Gordo fault. They were fed by fissures which formed in sympathy to movement on the master fault. Major ore bodies occurred also in the sheared Jefferson diabasic dike. Quartz veins with northwest strike yielded siliceous ores of silver, lead, and copper. Carbonate-zinc ores are secondary, derived by leaching of sulfide ores in the Union chimney vicinity. Supergene zinc-carbonate ores replaced unmineralized Lost Burro marble along bedding. In the lower part of the Union chimney, primary sulfide replacement was also controlled in part by bedding.

The Union ore channel was bottomed near the northwestward-trending San Felipe siliceous vein where the vein lies against a dacite porphyry dike. The very steep Jefferson chimney extended to a much greater depth, but was cut off below the 900 level by northwest-trending normal faults. Ore in the Despreciada section of the mine may represent faulted deeper parts of the Jefferson chimney.

South of Cerro Gordo, the Morning Star mine, the Charles Lease tunnel, and the 8,100-foot low-level Estelle tunnel were opened to explore the Castle Rock siliceous vein and ground beneath gossans in the Tin Mountain limestone. The Estelle also provided means of searching for inferred deep continuations of the rich Cerro Gordo ore channels. Morning Star and Estelle production was small. That of the Morning Star came principally from the Gold stope in Lost Burro marble. Estelle ore was mined near the tunnel level from upper Hidden Valley dolomite east of the Cerro Gordo anticline axis.

Among lesser mines the Ella, the Perseverance, and mines in Belmont Canyon yielded siliceous silver-bearing ores used as fluxing material in the Cerro Gordo furnaces. These mines are in a wide zone of northwest shearing which includes northwestward-trending quartz veins of the tetrahedrite-galena-barite type characteristics of the region.

West of Cerro Gordo the now inaccessible Ignacio mine lies in altered and intruded Chainman shale near the boundary with overlying silicated limestone of the Keeler Canyon formation. Principal Ignacio silver production seems to have come from a fissure zone along the northeastward-trending Ignacio fault. Westernmost mine of the Cerro Gordo area is the Sunset, which lies in partly silicated limestone of the Keeler Canyon. A small amount of lead and silver came from two narrow intersecting veins.

FIGURE 1.—Index map showing the location of the Cerro Gordo mining district (shaded) in New York Butte quadrangle.

INTRODUCTION

The Cerro Gordo mining district derives its name from a limestone peak (alt, 9,184 ft) near the south end of the Inyo Mountains (fig. 1). Together with a lofty northern prolongation known as the White Mountains, the Inyos occupy a position near the west margin of the Great Basin. Across Owens Valley rises the impressive Sierran scarp (fig. 2) culminating in Mount Whitney. On the east lies the rugged Panamint terrane and beyond it Death Valley. Roughly parallel mountain ranges and basins having a northwesterly trend characterize the Inyo-Death Valley region. Northward-trending geomorphic features, though evident, are less obvious than in the more typical Great Basin territory to the north and east.

At the foot of the southern Inyo Mountains is Owens Lake (alt, 3,570 ft), now practically dry (Gale, 1915) because of diversion of Owens River. Saline Valley, a smaller dry lake basin (Gale, 1914), flanks the range on the east, its lowest point (alt, 1,059 ft) some 2,500 feet below the Owens Valley floor (fig. 3). Difference of altitude from the Sierran crest near Mount Whitney to the Owens Valley floor is about 10,000 feet, and therefore commensurate with that which separates the higher Inyo summits from the bottom of Saline Valley.

Desert climate of the Inyos resembles that of other mountain ranges in the southern Great Basin. At Keeler, on Owens Lake, precipitation averages about 3.15 inches per year (Lee, W. T., 1906, p. 18; Lee, C.H., 1912, p. 23) but is considerably greater on the higher mountain slopes. During winter the range is sometimes snow covered above 6,000 feet; in fact, work stoppage at the Cerro Gordo mine by reason of heavy drifting snow is a not infrequent entry in the mine records. Cloudbursts in Keeler Canyon during the summer have many times partly destroyed the mine road, threatening vulnerable Keeler itself.

Persistent streams are few and small in the arid Inyo Mountains, unlike the Sierra Nevada which borders Owens Valley on the west. Normal runoff appears to be greater on the east slopes of the Inyos than on the west, where the disparity in moisture between this range and the opposing Sierra is patently manifested by differences in vegetation and geomorphic development. Except during storms the east flank of the Inyo Range is drained by a few minor spring-fed streams like that in Hunter Canyon 11 miles northwest of Cerro Gordo. Normally these do not exhibit surface flowage

(PP408, p. 1,2)

COMMODITIES

Barite

Barite

Coarse-grained barite occurs in a vein about 1,400 feet S. 85° W. of the highest point on the ridge back of the Lippincott mine. (See pl. 2). The barite occurs with quartz and limonitized pyrite in the vein, which is from 6 to 12 inches thick, and which crops out for about 25 feet in quartz-monzonite. The white barite is anhedral or subhedral and exhibits well the typical cleavage. A somewhat lamellar structure is outlined by limonitic stain. The specific gravity of a sample that has films of limonite on some fragments is, by pycnometer, about 4.3, which clearly distinguishes barite from other members of the group. (CSR42, p.53)

Barite

The mineral barite has been reported from many places in Inyo County,[152] but only one deposit, that in Gunter Canyon, has produced more than small amounts. No mines are active at the present time.

(47, p. 98)

Beryl

Miscellaneous Minerals

Beryl, graphite, iceland spar (optical calcite), and wollastonite are listed in the tabulated index of nonmetallic mineral deposits in this report. Exposures of beryl on the west flank of the Inyo Mountains, of graphitic schist in Telephone Canyon in the Panamint Range, and of wollastonite in Warm Spring Canyon, are unexploited. The deposit of iceland spar three miles north-northwest of Darwin has been worked, but the material failed to meet the requirements for optical purposes.

(C47, p. 127 See No. 4 Inyo mine)

Chiastolite

Localities in California. Nearly all of the andalusite mined in the United States has been obtained from the previously noted White Mountain area in Mono County, and about 18 miles north of Bishop (fig. 2). The andalusite deposits * are confined to a zone in a structurally complex terrane of metamorphic rocks — principally quartzite, sericite schist, and metaporphyry — of undetermined age. The whole is intruded by Mesozoic quartz monzonite. The andalusite-bearing zone trends roughly northward, is several miles long and probably averages no more than a mile in width. Within the zone the andalusite deposits are discontinuous and irregularly distributed, and only locally have they proved large enough and rich enough to warrant economic development. Most of the deposits occur within or marginal to large, elongate bodies of quartzite that range from a few hundred feet to 1200 or more feet in exposed width. Some lie within schist that borders the quartzite.

(C176, p. 276) See No. 10

Copper

Copper

Deposits containing copper minerals occur in many places in Inyo County, but copper is recovered only as a by-product. The largest amount now comes from the Pine Creek tungsten mine in the Bishop area. Here chalcopyrite and bornite are associated with the tungsten and molybdenum ore bodies. The ore milled has been 0.20 to 0.25 percent copper.[39] Copper is also a by-product of the lead-silver-zinc mines in the Darwin and Tecopa districts. (C47, p. 37)

In recent years practically the only property worked specifically for copper ore has been the Sally Ann mine in the Ubehebe district.

For descriptions of the copper deposits in the Darwin, Greenwater, and Ubehebe districts, see earlier publications of the Division of Mines.[40] (See C50)

Fluorite

Fluorite

Fluorite is a gangue mineral in the lead-silver deposits in the Cerro Gordo, Darwin and other districts.[161] Although low-grade deposits of fluorite are known in Warm Springs Canyon and other places in the Panamint Range, only the Warm Spring Canyon deposit has been worked, but the isolation of even this deposit has made mining of the fluorite uneconomic. (C47, p. 100)

Garnet

Garnet is an accessory mineral in nearly all of the scheelite-bearing tactite deposits. In the normal tungsten milling operations, garnet is removed from the gravity concentrate by means of electrostatic separators. The garnet so separated has been saved and marketed by some of the tungsten-producing companies. In recent years, garnet has been produced from old tailings by the Huntley Industrial Minerals, Incorporated (see text under tungsten).

Gold

Gold

Inyo County's total recorded gold production during the period 1880-1948 was $11,916,158 and represents the output from many mines in all parts of the county. Gold is often a minor but economically important constituent of ores which are mined chiefly for other metals, such as lead-silver, tungsten, and copper. Among the important gold mines in the county are the Cardinal Gold Mining Company deposit (Wilshire-Bishop Creek) 17 miles southwest of Bishop on the east slope of the Sierra Nevada; Reward mine (Brown Monster) 10 miles north of Lone Pine on the west slope of the Inyo Range; Skidoo mine at Skidoo in the Panamint Range; Ratcliff mine (Radcliff) in Pleasant Canyon on the west slope of the Panamint Range; Keane Wonder mine 22 miles west of Rhyolite, Nevada, on the west slope of the Funeral Range.

Gold deposits on the east flank of the Sierra Nevada are in quartz veins and quartzite in granitic rocks. Deposits of the Inyo Range are generally narrow veins which are either in or near the margins of granitic intrusive rocks.[42] Gold is associated with small amounts of sulphides. The orebodies of the Ratcliff mine in the Panamint Range consist of quartz lenses and masses enclosed in metamorphic rocks. At Skidoo, free gold is found in quartz veins in quartz monzonite, and at the Keane Wonder mine, lenticular quartz orebodies are enclosed in schist.

Placer gold deposits have been prospected and worked in several areas, especially in Mazourka and Marble Canyons on the west and east slopes of the Inyo Range. Production has never been great from these relatively small deposits.

Present gold mining activity is limited to a few small and scattered operations and reflects the general status of the industry. Postwar economic conditions have not been conducive to reopening many gold mines shut down by War Production Board Order L-208 issued in 1942.

(C47, p. 38)

Lead, Silver, Zinc

The first lead mined in California was probably that produced by Mormons from the southern part of the Panamint Range before 1859. Since then, mines in Inyo County have been the principal sources of lead in California, and in addition have produced considerable silver and zinc.

Silver and zinc minerals accompany those of lead in most of the deposits, which typically are cavity fillings or replacement bodies in calcareous rocks. The three major lead-producing areas in Inyo County are the Cerro Gordo, Darwin, and Tecopa districts.

The Cerro Gordo district produced the most lead, silver and zinc, valued at more than $17,000,000.[75] There has been no large lead-silver production since 1877, but most of the zinc was mined separately from secondary ore bodies in the Cerro Gordo mine during the period 1911 to 1915. This mine has been the most important in the district.

The Darwin district had produced about $7,000,000 worth of ore before the principal mines were purchased by the Anaconda Copper Mining Company in 1945.[76] In recent years Anaconda's Darwin Mines have been the chief source of lead in California. From figures published since 1945 on rate of production and grade of ore, it is estimated that the total value of lead, silver, and zinc produced in the district is now $15,000,000. The Zinc Hill area has produced zinc as both sulphide and oxidized ores, and was one of the largest producers of zinc ore in Inyo County in 1918.

The Tecopa district produced more than $3,000,000 worth of ore before 1928[77] and is now the second most important lead-producing district in the state, having a probable total production of $7,000,000 worth of lead and silver. The Gunsight, Noonday and War Eagle are among the mines consolidated under the name, Shoshone Mines, which is owned and operated by the Anaconda Copper Mining Company.

Considerable amounts of lead-silver ore have been produced from the Modoc and Slate Range districts, and small amounts from the Ubehebe, Leadfield, and other districts. Silver ore has been produced from veins in the Panamint City area, but not in recent years. (C47, p. 55)

Limestone[162]

Deposits of limestone and dolomite are abundant in Inyo County, but few have been exploited. In the southeastern part of the county, near Shoshone, a great thickness of Paleozoic limestone and dolomite has been measured, but has never been quarried;[163] the limestone and dolomite sections in the Argus and Panamint Ranges and the Darwin Hills contain lead-silver-zinc deposits which are mined, but only small amounts of limestone have been shipped. However, the limestone and dolomite of the Inyo Range, which also serve as host rocks for lead-silver minerals, have been extensively mined for limestone.[164] The Inyo Marble Company, which operated the quarry, produced commercial marble in white, gray, yellow, and black colors for dimension stone. The Inyo Range contains limestone and dolomite ranging in age from Cambrian to Triassic, but deposits of the Silurian and Devonian systems only are quarried.

The largest limestone-mining operation in the county is that of the West End Chemical Company in the Slate Range. The dolomitic limestone mined there is burned to produce carbon dioxide for the carbonation process in the company's brine plant on Searles Lake, San Bernardino County.

Tertiary travertine on the east side of Death Valley is well exposed in Furnace Creek Canyon. Onyx marble has been produced from the Argus Range west of Ballarat, and a marble deposit is worked in the low hills east of the Inyo Range. (C47, p. 100)

[161] Murdoch, Joseph, and Webb, Robert W., op. cit., p. 146.
[162] Dolomite, marble, onyx marble and travertine are also included in this section.
[163] Hazzard, John C., Paleozoic section in the Nopah and Resting Springs Mountains, Inyo County, California: California Div. Mines Rept. 33, pp. 273-339, 1937.
[164] Logan, Clarence A., Limestone in California: California Jour. Mines and Geol., vol. 43, pp. 242, 244-245, 1947.

KEELER AREA

Very extensive reserves of white, high purity dolomite exist near the rail line in the Keeler-Lone Pine district of Inyo County in both the Hidden Valley Dolomite and Anvil Springs Formation of Ordovician to Silurian age. High-purity white and blue-gray limestone deposits are also present in the nearby Lee Flat and Darwin districts to the east and southeast of Keeler, mostly in the Mississippian Bullion Member of the Monte Cristo Limestone. Premier Resources, Inc. currently produces dolomite marble near Keeler. (Limestone deposits in the Lee Flat, Darwin and Talc Hills vicinities and Dolomite district east of Lone Pine; Province V) (C194, p. 46)

Manganese

Manganese

Manganese in Inyo County is in bedded wad deposits (impure mixtures of manganese and other oxides); fissure deposits, in which manganese oxide is found in and adjacent to fissures especially fissures in volcanic rock, conglomerate and sandstone; and as a concentration in gossan zones in metamorphosed rock. Most of the deposits are in the Wingate Wash district in the south-central part of the county: others are in the Slate Range, in the northern part of the Coso Mountains, and in the Inyo Mountains. Location, extent, and tenor of the orebodies have not been conducive to their exploitation. A small tonnage of ore was shipped from a single property in Wingate Wash in 1943. (C47, p. 83)

Molybdenum

Molybdenum

Most deposits containing molybdenite, chemically molybdenum sulphide and economically the chief ore mineral of molybdenum, are genetically related to acidic igneous rocks. Many of the contact-metamorphic deposits, such as those worked for tungsten, also contain recoverable amounts of molybdenite.

The principal source in Inyo County, and in California, is the Pine Creek mine, a contact-metamorphic tungsten deposit, where molybdenite is associated with scheelite in all of the five known orebodies. The average grade of the ore milled has been from 0.40 to 0.45 percent MoS_2.

Wulfenite, lead molybdate, although of little commercial importance, is a common mineral in the oxidized zones of galena-bearing deposits, such as those of the Ophir mine in the Slate Range district, the Cerro Gordo mine, and mines in the Darwin district. (C47, p. 84)

Salines

Salines have been economically important to Inyo County in the past and constitute an enormous reserve of potential mineral wealth. The present production is small, particularly if compared with the years when the Death Valley borax deposits and the brines of Owens Lake were vigorously exploited. In the 9-year period, 1907-1915, 8 million dollars worth of borax was produced; in the 6-year period 1926-1931, soda output averaged 1½ million dollars annually. Complete production figures of all saline products are not available, as for the past several years annual statistics have been combined to conceal individual output.

In 1949 activity was confined to the production of borate minerals from a deposit near Shoshone and of borax and soda ash from Owens Lake. (C43, p. 128)

Borax

Borax[181]

Borax was first produced in Inyo County from crustal concentrations of the mineral in the playas of Death Valley, Saline Valley, and the Resting Springs district.[182] The important deposits, however, are those in the foothills of the Black Mountains in the Ryan area. Colemanite and ulexite occur here in a series of folded and faulted Tertiary sediments, within borate-bearing beds as much as 100 feet thick. Similar deposits are found in the Amargosa Valley near Shoshone.

Inyo County became the largest borax producer and remained so until the exploitation in 1926 of the Kramer deposits in Kern County. The newly discovered sodium borate mineral, kernite, proved more amenable to treatment than the calcium borate mineral, colemanite, and exploitation of the rich Inyo County deposits ceased in 1928.

Gypsum

Gypsum[183]

Gypsum deposits of Teritary age are found in Copper Canyon and Furnace Creek in the Death Valley region, in the Resting Springs district northeast of Tecopa, and near China Ranch. The China Ranch deposit, worked in the period 1914-18 by the Acme Cement and Plaster Company, consists of individual gypsum beds, 6 inches to 3 feet thick in a brown clay shale. The total thickness of the beds is as much as 20 feet.[184]

[181] Tucker, W. Burling, op. cit., pp. 274-277, 1921.
Tucker, W. Burling, op. cit., pp. 524-526, 1926.
Tucker, W. B., and Sampson, R. J., op. cit., p. 496, 1938.
Waring, Clarence A., and Huguenin, Emile, op. cit., pp. 62-69, 1919.

[182] Bailey, Gilbert E., Saline deposits of California: California Min. Bur. Rept. 24, pp. 36-49, 1902.

[183] Tucker, W. Burling, op. cit., p. 282, 1921.
Tucker, W. Burling, op. cit., p. 526, 1926.
Tucker, W. B., and Sampson, R. J., op. cit., p. 496, 1938.
Waring, Clarence A, and Huguenin, Emile, op. cit., pp. 85-87.

[184] VerPlanck, William E., Jr., Mineral commodities of California: California Div. Mines Bull. 156, p. 226, 1950.

Potash

Potash

Small amounts of Potash are associated with the salines of Owens Lake, Deep Springs Valley, Saline Valley, and Death Valley. The potash content of the deposits is too low to warrant exploitation as yet. The potash deposits of Owens Lake, Saline Valley, and Death Valley have been described by Gale[186] and that of Deep Springs Valley by Tucker and Sampson.[187]

Salt

Salt

Saline Valley has been the single source of salt or sodium chloride in the county, although the mineral is common in many of the saline areas. The salt beds of Death Valley, containing a high percentage of sodium chloride, represent enormous reserves. The Saline Valley operations, active in various periods between 1911 and 1930, have been reviewed by Tucker and Sampson.[188]

(C47, p. 129)

Slate

SLATE

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION SEC.	T.	R.	B&M	REMARKS
253	Slate Deposit	Mrs. R.S. McIlroy, Lone Pine	approx.	16S	38E	MD proj.	Beds of black, gray, and red slate strike N 30° W, dip 70° W. Material shipped in past years for roofing granules and flagstone. (Tucker 38:487.) (C47, p. 213)

Talc[12]

Talc mining in eastern California began in the period 1915-18. Since then deposits of Inyo County and north-central San Bernardino County have become one of the Nation's principal sources of high-quality talc. In the last decade the rate of talc production in this area has increased from slightly less than 40,000 to nearly 100,000 tons per year. The present output is valued second only to that of the Gouverneur district in New York.

About 60 talc-bearing regions of commercial interest are known in eastern California; one-half of these are in Inyo County. The talc deposits of the county are of two distinct geologic types, each in a separate geographic belt. One talc-bearing belt, which will be referred to as the Inyo Range talc belt, extends northward from the vicinity of Darwin to include the Inyo Range, a part of the northern Panamint Range, and the Eureka Valley area. The other belt lies mostly in San Bernardino County, but its northern part is in Inyo County and includes several deposits of commercial significance. This belt extends from the southeastern slope of the Panamint Range eastward to the eastern part of the Kingston Range, a distance of about 70 miles. This will be referred to as the Southern Death Valley-Kingston Range talc belt.

Talc mining in the Inyo Range belt has centered mainly about a group of deposits in the Talc City mine area about six airline miles northwest of Darwin. The Talc City mine itself with a total output of about 250,000 tons has been by far the largest producer. Other properties within a five-mile radius of the Talc City mine are the Alliance, Irish, Frisco, Trinity, East End, Victory, and White Swan mines. These have been worked on a much smaller scale than the Talc City mine.

A group of talc deposits on the southeast slope of the Inyo Range and about 26 airline miles northwest of Darwin is the only Inyo County talc source other than the Talc City mine that has been continuously worked during the last decade. These deposits are generally referred to as the White Mountain mine but include the White Mountain, Florence, and Alberta properties. The deposits of this area are discontinuous bodies exposed for a distance of two miles on the walls of an east-trending canyon. Their combined total output probably does not exceed 50,000 tons.

A third group of talc deposits is in an area on the east flank of the Inyo Range overlooking the northern end of Saline Valley about 20 miles north of the White Mountain mine. In this area three properties, The White Eagle, Willow Creek, and Eleanor mines, have been worked from time to time but have a total output that is probably less than 10,000 tons.

From several hundred to several thousand tons of talc have been obtained from the following other properties in the Inyo Range region: the Lakeview, Lenbeck, and White Star mines, 2½ airline miles north-northwest of Keeler, the Blue Stone mine about ten miles east of Independence, and the Nikolaus mine in the Eureka Valley area.

The part of the Southern Death Valley-Kingston Range talc-bearing belt included in Inyo County contains four talc localities that have yielded more than a few hundred tons. Of these only one property has been worked continuously during the period 1945-1950. This is the Warm Spring deposit in Warm Spring Canyon in the southeastern part of the Panamint Range. The Montgomery and Death Valley deposits, also in the southeastern Panamints, have been worked intermittently, as has the Eclipse mine in the northern Ibex Hills. Unexploited talc deposits in Anvil Canyon in the southeastern part of the Panamint Range, the southern part of the Amargosa Range, and the central part of the Ibex Hills are scheduled to be opened by 1952. Most of the talc output of the Southern Death Valley-Kingston Range belt, however, has been obtained from six properties in San Bernardino County. (C47, p. 113)

Deposits of the Inyo Mountains—Northern Panamint Range Region, Inyo County. Nearly all of the talc of steatite grade and much of the non-steatite talc that have been produced in California have been obtained from a region in central Inyo County that embraces the Inyo Mountains and the northern part of the Panamint Range (fig. 4). The talc deposits of this region have altered from Paleozoic sedimentary rocks and locally from Mesozoic granitic rock. These deposits, which generally are smaller and more irregular than those of the southern Death Valley-Kingston Range region, have formed mainly along fractured and sheared zones in dolomite of the Lower Ordovician Pogonip formation, the Middle Ordovician Eureka quartzite, the Upper Ordovician Ely Springs dolomite, and dolomite and quartzite of Silurian age.

Talcose zones (fig. 5) are most abundant along major contacts, especially those between quartzite and dolomite, and the talc ordinarily has replaced both rocks. The deposits that have replaced granitic rock occur in areas where these other types also exist. Many of the deposits are closely associated with bodies of a punky, limy rock which originally was dolomite and from which most or all of the magnesia, added to form the talc, appears to have been derived.

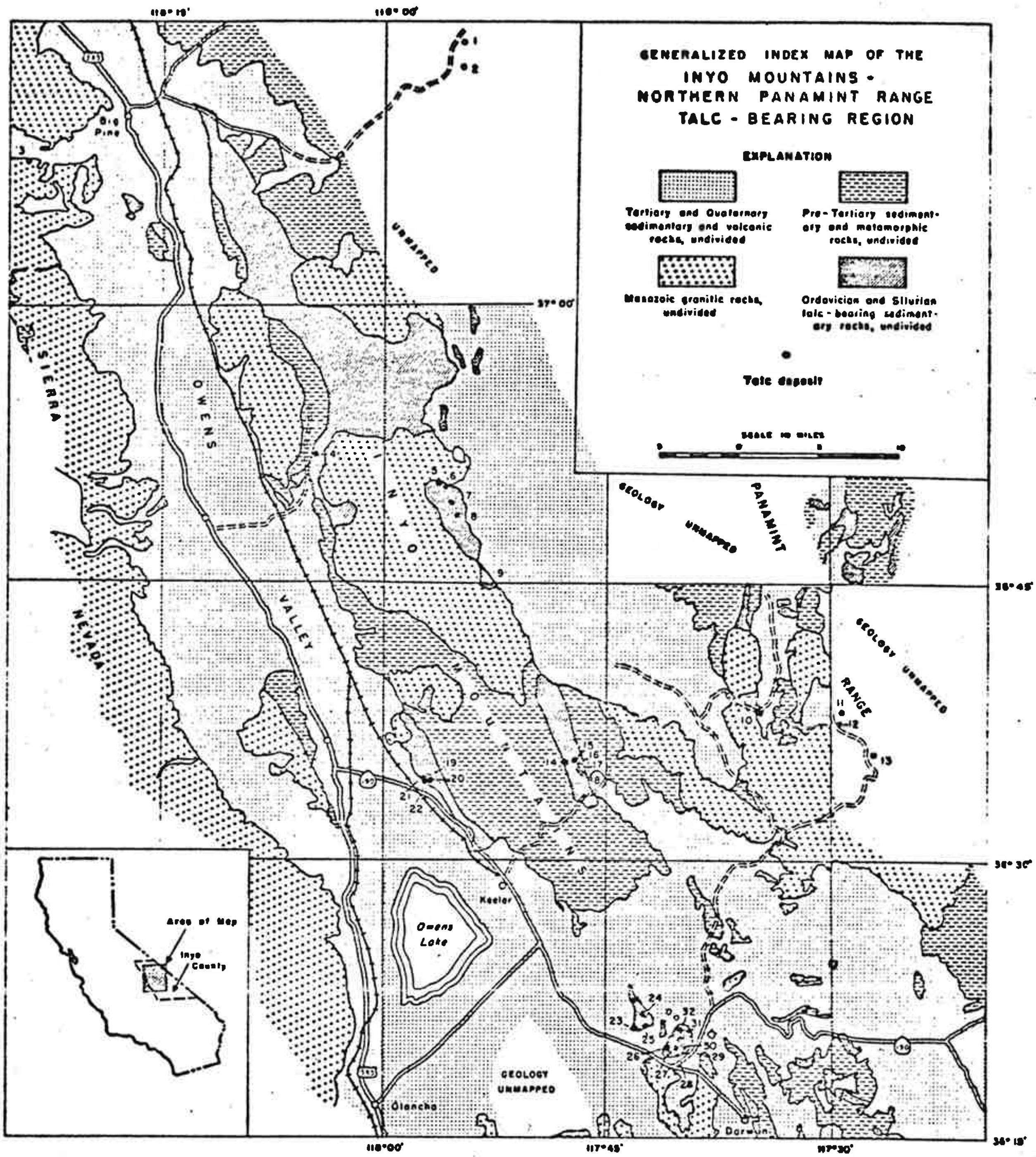
The mined material ranges in color from dark gray through pale green to white, is fine-grained, and consists predominantly of the mineral talc. Indeed the chemical composition of much of the material, when selectively mined and sorted, approaches that of the pure mineral. The principal impurities are carbonates (mainly as fracture-fillings) and iron oxides. These are abundant enough to cause much of the mined talc to be of sub-steatite grade. As much of the darker colored talc from this region fires nearly white, a dark color is not necessarily an objectionable property.

The largest and most continuously active talc mining operation in this region is the Talc City mine (fig. 6) in low hills at the southern end of the Inyo Mountains. This mine has yielded talc mainly from three bodies, two of

which are elongate, steeply dipping lenses, each 500 to 1,000 feet long and 50 feet in maximum width. The Talc City deposits are enclosed mainly in dolomitic limestone of Ordovician age. One of the lenses has been mined down-dip to a maximum of about 450 feet; the other apparently is much shallower. The second most productive talc-bearing area in the Inyo Mountains comprises a 2-mile belt in the southeast part of the mountains. The deposits have been developed by a group of small workings known collectively as the Bonham operations and embracing three principal mines, the White Mountain (fig. 7), Florence and Alberta. The Bonham deposits individually are smaller but much more numerous than those at the Talc City mine, and are largely or wholly replacements of dolomite and quartzite of Silurian age (C. W. Merriam, personal communication, 1951).

The rest of the talc output of the Inyo Mountains—northern Panamint Range region has been obtained mostly from the Alliance mine in the Talc City area, and the Nicolaus (Eureka) and White Eagle mine in the northeastern and east slope of the Inyo Mountains respectively. In California, only the White Eagle deposit has yielded large tonnages of talc that has altered from granitic rock. Relatively undeveloped deposits that appear to have substantial reserves exist at the Gray Eagle mine, on the west face of the Inyo Mountains and at the Ubehebe mine in the northern Panamint Range.

The massive chlorite, noted above, is obtained from the Frisco mine which is near the Talc City mine and has a similar geologic setting. The chlorite has altered from acidic or intermediate dikes and is associated with talc that has altered from dolomite. (C176, p. 627)



TALC MINES AND PROSPECTS

1. Long Horn mine
2. Nikolaus (Eureka Valley) mine
3. Blue Star mine
4. Blue Stone mine
5. Willow Creek mine
6. White Eagle mine
7. Doris Dee prospect
8. Gray Eagle (Rogers, Eleanor) mine
9. Hilderman mine
10. Homestake prospect
11. Ubehebe (Stone pencil) mine
12. White Horse mine
13. Gold Bell (Quackenbush) mine
14. Bonham (White Mountain) mine
15. Alberta and Florence mines
16. Moss mine
17. Branson prospect
18. Skinner mine
19. Lenbach mine
20. Powderpuff prospect
21. Lakeview mine
22. Eclipse mine
23. White Swan mine
24. Smith mine
25. Viking mine
26. Trinity mine
27. Frisco mine
28. Talc City mine
29. Bob Cat prospects
30. Silver Dollar mine
31. Alliance and Irish mines
32. Victory mine

FIGURE 4. Map of the Inyo Mountains-northern Panamint Range region showing the distribution of the principal rock units and tl location of talc mines and prospects. Geology modified from the Death Valley and Bakersfield sheets of the State Geologic Map, Californ Div. Mines, 1955, and from the original sources as shown on these sheets.

(C176, p. 626)

(p. 29 follows

Tungsten

Tungsten

Production of tungsten in Inyo County has come principally from the Bishop area. The deposits in this area are distributed along the eastern slope of the Sierra Nevada and in the Tungsten Hills. The district, extending from Round Valley southward about 20 miles, includes the Pine Creek area to the west. It is one of the few areas in the world where scheelite occurs in commercial quantities in contact-metamorphic deposits.

Tungsten production from this district through 1948 has been about 900,000 units of WO_3, of which about 85 percent has come from the Pine Creek area. The estimated total production through 1945 from the Tungsten Hills was 125,000 units of WO_3.[135] The largest percentage of the ore produced at Tungsten Hills was mined during the period 1916-18. Most of the Pine Creek ore has been produced since 1938.

A second, and much less important, tungsten-producing area is the Darwin district. Tungsten minerals have been known from here since

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[128] Fraser, H. J., and others, Hot springs deposits of the Coso Mountains: California Div. Mines Rept. 38, p. 223, 1942.

[129] See tabulated list of mines and mineral deposits.

[130] Dupuy, Leon W., Bucket-drilling the Coso mercury deposit, Inyo County, Calif.: U. S. Bur. Mines Rept. Inv. 4241, p. 3, March 1948.

[131] Ross, Clyde P., and Yates, Robert G., The Coso quicksilver district, Inyo County, California: U. S. Geol. Survey Bull. 936q, p. 357, 1943.

[132] Dupuy, Leon W., idem.

[133] Tucker, W. B., and Sampson, R. J., op. cit., pp. 460-462, 1938.

[134] Ross, Clyde P., and Yates, Robert G., op. cit., p. 407.

[135] Bateman, Paul C., Erickson, Max P., and Proctor, Paul D., Geology and tungsten deposits of the Tungsten Hills, Inyo County, California: California Jour. Mines and Geol., vol. 46, p. 23, 1950.

(C47, p. 85)

Tungsten

Cuprotungstite (Alvord?) Claim

The best scheelite occurrence that is known in the quadrangle is on the Cuprotungstite claim (see fig. 2), along a trail from Racetrack Valley to Big Dodd Spring. It is about 2½ miles from the northern end of the trail at the Lippincott mining camp about 4,480 feet above sea level, and in sec. 30, T. 15 S., R 41 E. (projected). The owner of the Cuprotungstite claim in 1949 was Roscoe Wright, who has held it since 1945. Older claim notices call it the Honolulu claim of Wallace Todd and associates in July of 1941, and the Carol claim of Ira Klein and F. R. Kelley in February of 1941. Perhaps it is in the old Alvord group, which was located in 1916 by William Elliot, Ray Spear, and Ross Spear and was described as containing scheelite associated with copper and iron minerals (Waring and Huguenin, 1919, p. 131). The 20-foot open cut, which extends a few feet underground, appears to have been made long before 1940.

The scheelite is coarse-grained, as much as 2 inches in diameter but more commonly 1 inch or less. Almost all the scheelite is concentrated in a small area about a foot long and half a foot wide in the face of the shallow workings. Much of the scheelite is a characteristic yellow green of cuprotungstite, and it is associated with malachite and chrysocolla. The gangue, which contains much limonite after pyrite, consists of garnet, quartz, and calcite. Other minerals include hematite, magnetite, and chalcopyrite. A polished section shows that there is a little bornite with the chalcopyrite, and that some chalcocite, veined with cuprite, rims and transects chalcopyrite.

The deposit is isolated in marble of the Pogonip limestone, and it is about 500 feet from the exposed contact of the quartz-monzonite batholith at Hunter Mountain. It is not in a general zone of tactite and does not encourage, under present working conditions and isolation, further exploration of the tungsten occurrence.

(CSR42, p. 51 Ubehebe Peak quad.)

Uranium

Ubehebe (13) and Lippincott (14) Mines. The Ubehebe mine in secs. 1 and 2, T. 14 S., R. 40 E. (projected) and the Lippincott mine in sec. 13, T. 15 S., R. 40 E. (projected), Inyo County, are about 20 miles northeast of Owens Lake at an altitude of approximately 4,000 feet. Workings at the Ubehebe mine, principally adits and stopes, total more than 2,300 feet; workings at the Lippincott mine consist of about 2,000 feet of adits and inclines. Prior to 1951, the Ubehebe mine yielded over 2,000,000 pounds of lead, more than 100,000 pounds of zinc, nearly 35,000 ounces of silver, and some copper (McAllister, 1955). Production records for the Lippincott mine are incomplete; apparently some lead, silver, and minor amounts of gold have been produced.

The deposits consist essentially of irregular replacement bodies and fracture fillings in dolomite of Paleozoic age, which has been intruded by quartz monzonite, locally by syenite, and by minette dikes. The ore bodies consist chiefly of cerussite, hemimorphite, hydrated iron oxides, wulfenite, anglesite, silver-bearing galena, and sphalerite.

Anomalous radioactivity is caused by an undetermined uranium mineral associated with wulfenite in the ore zones. Analysis of samples indicates a uranium content of from 0.001 to 0.05 percent.

(CSR49, p. 35)

Wollastonite

Wollastonite

Wollastonite, which occurs widely in the calc-silicate rock, forms anhedral grains ranging in size from microscopic, as in the wollastonite-diopside-plagioclase rock of San Lucas Canyon, to as much as 4 inches long in somewhat bladed aggregates of wollastonite near the Bonanza mine. The wollastonite generally is nearly white, but the coarsest wollastonite, which contains disseminated grains of chalcopyrite, ranges from light brownish gray (5 YR 6/1) to yellowish gray (5 Y 8/1). The wollastonite was identified by its characteristic optical properties, including the orientation of the optic axial plane, which is about 4° from normal to the zone of cleavage, and the nX of about 1.62. C. D. Rinehart (written communication, 1952) took two readings of the 2V from the same grain on a universal stage and got 35° and 36°. Wollastonite at the quartz-monzonite contact of a 100-foot zone of calc-silicate rock (No. 3, fig. 2) 1.6 miles N. 36° E. of the Cerro Gordo road junction in San Lucas Canyon, is closely associated with green-zoned garnet, calcite, epidote, quartz, chalcedony, and stilbite. Southwest in the same range, at a contact about 2,000 feet N. 80° E. of the end of the road north of the Cerrusite mine, white wollastonite is intergrown with moderately coarse grained grayish-green diopside and forms some coarser grained aggregates of pure wollastonite in marble.

(CSR42, p. 62)

White Eagle Mine. Location: About 25 airline miles north-northwest of Keeler or 137 miles by road from Keeler via Big Pine, in the NE¼ T. 13 S., R. 37 E., M.D.M. (projected), on the east slope of the Inyo Range. Ownership: Sierra Talc and Clay Company, 5509 Randolph Street, Los Angeles, California. Under lease to Wright Huntley of Bishop, California.

Most of the talc in the mine area is in a large, irregular body with an outcrop plan about 500 feet long and 160 feet in maximum width. This body has formed near the contact of a section of Paleozoic sedimentary rocks with the large quartz monzonite mass that occupies much of the central part of the Inyo Range. The talc has formed mostly at the expense of quartz monzonite, but both dolomite and quartzite in the sedimentary section have also altered to talc. Gray talc has formed from dolomite, white talc from quartzite, and light green talc from quartz monzonite. Each type is fine-grained, compact, and resembles talc found elsewhere in the Inyo Range.

Three short adits have been driven into the main body, but most of the talc has been mined by open cut benching. Further benching, however, will involve removal of large quantities of overburden, a slide of which now covers much of the quarry face. The talc is transported to the valley floor by means of a 2000-foot jig-back aerial tram. Production has been between 3000 and 4000 tons of talc.

The property is idle. (C47, p. 121)

Index No. 1 on MDLU map and in Table

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION SEC.	T.	R.	B&M	REMARKS
54	Keynote (Key Not, Golden Princess)	Golden Princess Mining Co., Lone Pine (1938)	—	14S	37E	MD proj.	Two quartz veins in granite carry free gold associated with pyrite and chalcopyrite. Principal work on Keynote, vein is 7 adits War Eagle vein worked by 3 adits. Total reported production $500,000. (Burchard 84; 159; Crawford 94;138; 96;181; Davidson 02;8, 11; Knopf 14;112; 18;118; Tucker 26;470; 38; 404–405,474,pl.3; Waring 19;81.)

No. 2 (C47, p. 154)

37	Big Horn	S. R. Spear, Lone Pine (1939)	35?	14S	37E	MD	Class C, Type 1. Mine developed by a 90-foot shaft and 80-foot tunnel. Produced 1918 to 1939, intermittently, a moderate tonnage of ore assaying 20% lead, 3.48 ounces

INYO COUNTY (CONT.)

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION SEC.	T.	R.	B & M	REMARKS
	Big Horn (continued)						silver, 0.185 ounces gold, and some copper. (Eric 48: 238; Tucker 38a:383, pl. 3) (C53, p. 454-455)

No. 3

BERYL

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION SEC.	T.	R.	B & M	REMARKS
	Inyo	Walter J. Sorenson Gladys E. Smiley, Lone Pine. Leased to Edward L. Anderson. (1944)	—	16S	37E	MD proj.	Altered pegmatite (?) with small blue and green beryl crystals. Short adit; no production (Murdoch 48:70.) (C47, p. 203)

No. 4

Inyo beryl deposit

DESCRIPTION OF THE DEPOSIT

Biotite granite outcrops along the base of the Inyo Mountains on which the claims are located. This granite covers an area about 3 miles long and 1 mile wide. It is bordered on the northeast by marine sediments that strike N. 50° W. and dip NE. On the northwest and southwest sides the biotite granite contacts a much lighter colored granite, which strikes N. 50° to 60° W. and dips northeast.

In about the center and on the east side of the Inyo Beryl claim, nearly horizontal beds of gray limestone about 400 feet square in surface dimensions remain as a small pendant in the granite. The limestone on the south and west sides has been altered in a zone 15 to 25 feet wide. In this altered zone, the usual contact metamorphic minerals were formed; chiefly epidote, garnet, and quartz. North of the limestone area, the granite is intruded by dikes of hornblende and felsite that have a general east-west trend and dip steeply north.

Beryl mineralization, especially on the Inyo Beryl claim, generally occurs along fractures in the granite. In the altered zone on the granite-limestone contact, beryl veinlets in epidote and limestone were observed. The beryl-bearing stringers appear to be related to nearby pegmatitic dikes, as some are composed of fine-grained pegmatitic material; most, however, are enclosed by granitic rocks. In general, the stringers and veinlets exist as fracture fillings ranging from thin seams to 4 inches in thickness and consist of muscovite, quartz, albite, and beryl, with or without epidote and fluorite. The beryl veinlets in the better exposures are 3 to 6 inches apart, but ordinarily are 2 to 4 feet apart. At one exposure, 4 seams totaling 3 inches of beryl were measured in a 5-foot section. Other exposures show an intermixture of quartz and beryl 6 inches wide, with beryl occupying 15 to 25 percent of the total vein filling.

DEVELOPMENT

Development openings on the property comprise numerous small surface cuts and pits, irregularly spaced in an area 600 feet wide and 1,500 feet in length and two short adits. One adit about 30 feet in length follows an oxidized zone and probably was driven before beryl was recognized. The other adit about 15 feet in length follows a veinlet of beryl associated with fluorspar. The veinlet varies for one-fourth to 2 inches in width.

The small cuts and pits are not more than 1 to 2 feet in depth and about 4 feet in cross section. Beryl shows in most of these excavations.

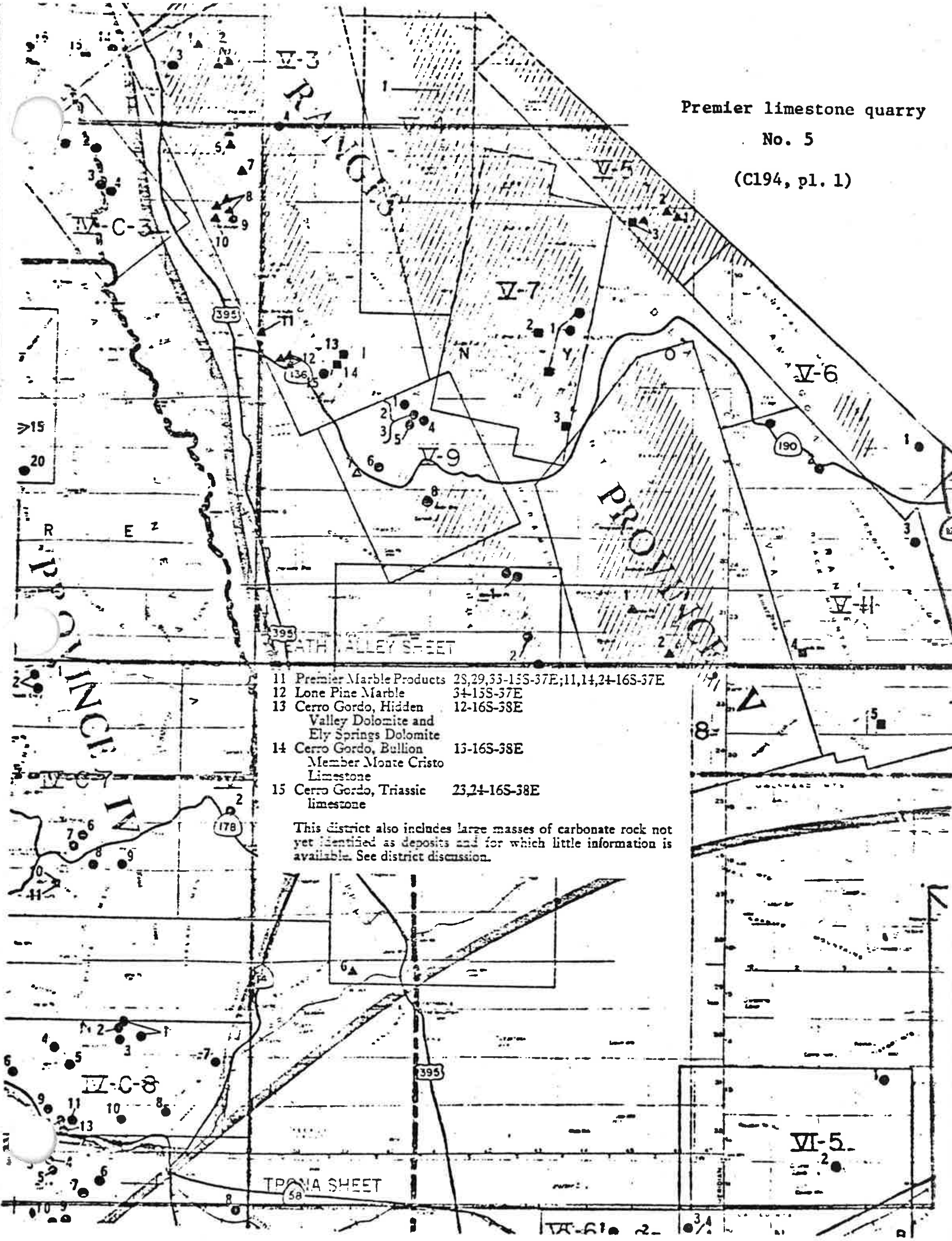
Trenching by the U.S. Bureau of Mines was started June 21, 1960, and completed July 18, 1960. * * *Most of the 207 samples from the 20 trenches contained no beryl, but 47 of them contained from 0.01 to 1.09 percent BeO. (RI6013)

No. 4

Premier limestone quarry

No. 5

(C194, pl. 1)



OBSERVATIONS ON THE DISTRIBUTION OF CHEMICAL ELEMENTS IN THE TERRESTRIAL SALINE DEPOSITS OF SALINE VALLEY, CALIFORNIA

by

Oreste W. Lombardi
Research Department

ANALYTICAL RESULTS

The analyses of the evaporation residues of brines drawn from boreholes in Saline Valley are shown in Table 1. Also included are analyses of ground water from areas near the playa margin, which threw some light on the changes occurring in ground water as it merges into the playa waters. Saline Valley samples 12, 13, 14, and 15 were collected from "brine"[9] springs on the playa, and sample 34 was collected from surface waters on the southwest side of the playa.

The analyses are reported in percentages or parts per million of the evaporation residue. Most of the results contained in Table 1 are plotted on the brine residue maps (Fig. 13-20, to appear later). Sample locations are marked on the brine residue maps and on the geological maps (see Plates 1 and 2).

GEOCHEMISTRY OF THE SALT DEPOSITS

The saline deposits consist of brine-saturated muds (Table 2) and sands with a saline crust on top (successive salt layers at depth occur in the sodium chloride zone in the southwest part of the playa and are entirely possible in other parts of the playa). Figure 11 shows a diagram of the salt deposits. Fresh ground waters approaching the salt deposits are forced to the surface by the more dense brine along the margins of the salt deposits and by faults bordering the saline area. On the southwest margin of the playa, fresh waters enter the saline deposits on the surface. On the east and north sides of the playa permeable

[8] A G. Frederick Smith Chemical Co. reagent.

[9] The brine springs are a small upwelling of brine on the eastern margin of the playa, which flows west for about 300 feet on the surface and within 1 foot of the surface for another 1,000 to 2,000 feet.

TABLE 1. COMPOSITION OF BRINE RESIDUES

Sample[a]	Li	Na	K	Rb	Mg	Ca	Cl	Br	B	CO_3	SO_4	Cr	V	Cu	Mo	W	I[b]	Salinity, %	pH	Depth to water, ft	Sediments
	Substance, %											Substance, ppm									
2[c]	0.03	36	2.0	0.03	1.0	1.0	50	0.25	0.12	0.8[d]	10.0	1	—	2	20	—	4	17	—	3	silt
3	0.02	36	3.5	0.06	0.01	0.01	42	0.07	0.15	6.0	10.0	2	10	2	100	—	5	20	9.6	4	sand
4	0.2	30	7.0	0.2	0.1	3.0	40	0.3	0.15	6.0	20.0	1	10	20	20	—	50	1.9	9.8	—	sand
5	0.01	29	3.0	0.5	3.0	0.1	21	0.02	0.05	—	45.0	1	1	20	800	300	—	28	7.6	3	gravel, sand
6	—	37	1.5	—	0.01	0.1	43	0.15	0.6	6.0	10.0	2	30	20	50	500	—	2.6	9.5	6	silt, clay
7	0.03	35	2.0	—	—	—	26	0.5	1.5	7.0	25.0	—	—	—	—	—	8	12	9.2	6	silt, clay
7'[e]	—	35	2.0	—	—	—	—	0.5	1.7	0.5	—	—	—	—	—	—	—	—	8.8	5	silt, clay
8	—	35	1.0	—	—	—	31	0.4	0.4	6.0	25.0	—	—	—	—	—	5	15	9.4	2	sand
9	0.03	35	3.5	0.05	0.01	0.01	49	0.05	—	—	8.0	2	1	20	2	100	8	12	—	1.5	sand
10	—	—	2.5	—	—	—	—	0.15	0.3	—	5.0	—	—	—	—	—	—	20	—	—	sand
11	0.4	34	2.5	0.02	0.1	0.01	45	0.15	0.25	6.0	8.0	1	1	20	2	—	10	1.6	—	2	sand
12	0.02	36	3.5	0.04	0.1	0.01	50	0.15	—	—	8.0	1	1	10	3	100	3	29	—	0	silt
13	0.01	35	2.5	0.03	0.01	0.01	42	0.03	—	—	15.0	—	—	3	—	—	2	18	—	0	silt
14	0.01	37	2.5	0.03	0.1	0.01	48	0.04	—	—	10.0	1	1	200	1	—	7	10	—	0	silt
15[f]	0.02	35	5.0	0.04	0.01	0.01	51	0.04	—	—	7.0	1	~3	5	3	—	3	18	—	0	sand
16	0.01	37	3.5	0.2	0.03	0.003	47	0.2	—	—	—	2	—	1	3	—	20	2.1	—	2.5	sand
17	0.01	32	2.0	0.3	0.3	3.0	45	0.3	—	—	15.0	5	10	2	3	—	30	1.2	—	2.5	sand
18[g]	0.01	33	3.5	0.2	0.3	0.3	46	0.2	—	—	7.0	2	10	5	—	—	50	1.8	—	3	sand
19	—	33	2.0	0.5	3.0	0.1	48	0.2	—	—	15.0	1	1	3	50	500	—	28	—	5	sand
21	—	—	3.0	—	—	—	—	—	—	—	7.0	—	—	—	—	—	—	9	—	—	—
21'[i]	—	—	2.0	—	1.0	1.0	—	0.2	0.3	—	5.0	—	40	1	—	—	—	30	7.0	0	silt, clay
22	0.01	36	1.5	0.08	0.1	0.1	48	0.5	0.08	0.4[h]	0.1	10	3	1	1	200	0.4	32	—	5	silt
23	0.02	36	1.0	0.005	0.01	0.01	45	0.4	0.15	0.6[h]	15.0	1	3	10	10	—	180	30	—	5	silt
24	—	35	2.5	—	—	—	45	0.25	0.25	0.4[h]	15.0	—	—	—	—	—	6	30	—	1.5	sand
26	0.05	31	5.0	0.04	0.01	0.3	31	0.6	2.0	—	20.0	—	3	0.3	2	—	10	30	—	2	sand
27	0.3	35	2.5	0.02	0.1	0.1	41	0.15	0.7	4.0	15.0	10	3	40	—	—	30	1.2	—	3	sand
28	—	34	1.5	—	0.2	0.01	~51	0.2	—	—	—	2	5	400	20	300	—	3.0	7.0	0	calcareous ooze
29	0.002	36	1.0	0.03	0.1	0.1	~55	0.3	—	—	7.0	1	3	15	—	—	—	36	7.1	0.1	calcareous ooze, NaCl
30[i]	—	36.5	1.3	—	0.23	0.08	50.2	—	1.7	0.29[d]	8.1	—	—	—	—	—	—	30.7	7.6	0	calcareous ooze
31[j]	—	35	1.1	—	0.16	0.07	49	—	1.6	0.26[d]	8.6	—	—	—	—	—	—	31.5	7.6	0	calcareous ooze, NaCl
32	0.003	36	2.5	0.04	0.3	0.03	~32	0.3	—	—	8.0	5	1	5	—	—	—	26	—	0.2	calcareous ooze, NaCl, clay
33[k]	—	36.7	1.2	—	0.15	0.09	51.5	—	1.6	0.21[d]	5.5	—	—	—	—	—	—	29.9	7.5	0.1	calcareous ooze, NaCl, clay, sulfides
34	0.07	36	1.5	0.03	1.0	0.03	54	0.3	0.3	—	6.0	1	1	3	1	—	2	33	—	0.3	calcareous ooze, NaCl, clay
35	0.003	32	2.0	0.04	0.1	0.01	44	0.25	0.15	—	9.0	1	1	10	1	30	2	31	—	0.5	clay
36	0.02	37	1.0	0.02	0.1	0.3	52	0.3	0.15	—	7.0	2	3	3	10	—	<1	27	—	0	calcareous ooze, clay, silt
37	0.004	38	0.7	0.04	0.1	0.01	55	0.3	—	—	5.0	1	1	4	1	—	10	31	—	0.2	calcareous ooze, silt
38	0.03	—	0.3	—	0.01	0.3	—	0.02	—	—	10.0[l]	—	5	0.3	2	—	5	1.8	—	3	calcareous ooze, silt
39	0.004	—	0.2	0.07	2.0	10.0	—	—	—	—	7.0	3	10	1	10	—	40	4.6	—	4	silt, clay
40	0.02	37	1.0	0.06	0.01	0.03	53	0.25	0.1	—	7.0	2	3	2	10	—	<1	29	—	5	silt, clay
41	0.02	37	0.3	0.01	0.3	0.1	52	0.25	0.1	—	9.0	1	1	3	2	—	<1	25	—	0	calcareous ooze
42	0.02	34	6.0	0.01	0.01	0.01	50	0.25	0.15	—	—	—	1	3	1	—	<1	28	—	3	calcareous ooze, silt
43[m]	0.001	—	—	—	10.0	10.0	—	0.5	—	—	10.0	10	400	10	50	2,000	—	0.7	—	4	sand
45	0.02	36	2.0	0.03	0.01	0.03	46	0.3	0.2	0.2	15.0	1	1	5	10	—	6	25	—	3.5	silt
46	0.006	—	0.8	—	1.0	10.0	—	0.2	—	—	9.0[l]	5	50	10	50	1,000	3	3.3	—	4	sand
47	0.007	—	2.0	—	3.0	10.0	—	0.5	—	—	15.0[l]	5	40	1	20	2,000	30	1.5	—	4	sand
48[n]	—	28.6	11.5	—	0.68	0.38	20.7	—	2.8	0.6	32.0	—	—	—	—	—	—	0.42	8.5	5	silt, clay
49	—	34	3.0	0.1	0.3	3.0	50	0.06	—	—	10.0	2	3	20	30	400	—	4.4	—	2.5	silt, clay
50[o]	—	29.5	6.0	—	0.04	0.05	13.5	—	1.3	7.1[p]	37.0	—	—	—	—	—	—	0.68	—	6	silt, clay
51[q]	—	36.2	1.0	—	0.30	0.60	53.0	—	0.1	—	8.2	—	—	—	—	—	—	6.34	7.8	5	silt, clay
52[r]	—	31.8	0.58	—	0.44	0.88	20.9	—	0.5	14.3	26.6	—	—	—	—	—	—	0.225	8.3	8	sand
53[s]	—	29.3	—	—	0.32	3.2	9.7	—	0.5	24.7+	20.6	—	—	—	—	—	—	0.069	8.4	10	silt

[a] All samples contain about 1 ppm chromium.
[b] Iodine present as IO_3^-, except in samples 7, 8, 11, 12, 24, 27, 34, 35, 36, and 41 where it is present as I^-.
[c] Contains 1 ppm silver.
[d] Largely HCO_3^-.
[e] Sample 7' was green in color, because of the presence of algae. The sample was taken very near sample 7 (within 500 feet), in an open pool of water at the bottom of a sinkhole.
[f] Contains 15 ppm lead.
[g] Contains 10 ppm lead.
[h] Also present as HCO_3^-.
[i] Contains 0.011% SiO_3 and 1.3 ppm PO_4.
[j] Contains 0.011% SiO_3 and 2.0 ppm PO_4.
[k] Contains 0.0023% SiO_3 and 1.8 ppm PO_4.
[l] Data questionable.
[m] By spectrographic determination, 200 ppm tellurium, 50 ppm nickel, and 10 ppm chromium present.
[n] Contains 0.76% SiO_3.
[o] Contains 0.43% SiO_3 and 0.2% fluorine.
[p] About 75% HCO_3^-.
[q] Contains 0.68% SiO_3 and 0.04% fluorine.
[r] Contains 4.3% SiO_3 and 0.18% fluorine.
[s] Contains 12.2% SiO_3 and 0.32% fluorine.

sands permit ground waters to flow into the playa a few feet under the surface, where evaporation concentrates the incoming waters to saturated brine without emergence. On the east side of the playa, there are brine springs along faults. Table 3 shows the composition of the dissolved material in the spring waters and ground waters. There is an artesian well about 1 mile north of sample 5 borehole. The existence of the well

TABLE 2. Composition of Saline Valley Lake Muds

Sample	Substance, %										Substance, ppm					
	Li	K	Rb[a]	Mg	Ca	$CaSO_4$	CO_3 (Ca, Mg)	Clay	Silt	Brine	Cu	V	Cr	Mo	W	Pb
7	50	2	0.4	3	3	1	20	40	10	30	50	10	80	2	400	......
19	......	0.2	.4	1	10	20	20	5	5	40	20	....	3	3	500	......
20	50	2	.4	3	3	2	10	60	10	20	50	10	100	3	300	......
21	50	2	.4	3	3	2	20	40	10	30	50	5	80	4	400	......
22	50	2	.4	3	3	1	20	50	10	20	50	10	80	4	400	......
23	50	2	.4	3	3	1	15	5	60	20	50	10	80	....	400	......
25	100	2	.4	3	3	1	20	50	10	20	50	20	100	1	......	600
28[b]	20	2	0.4	10	10	....	40	10	5	50	40	10	100	10	......	400

[a] Rubidium values uncertain.
[b] Also contains 20 ppm silver.

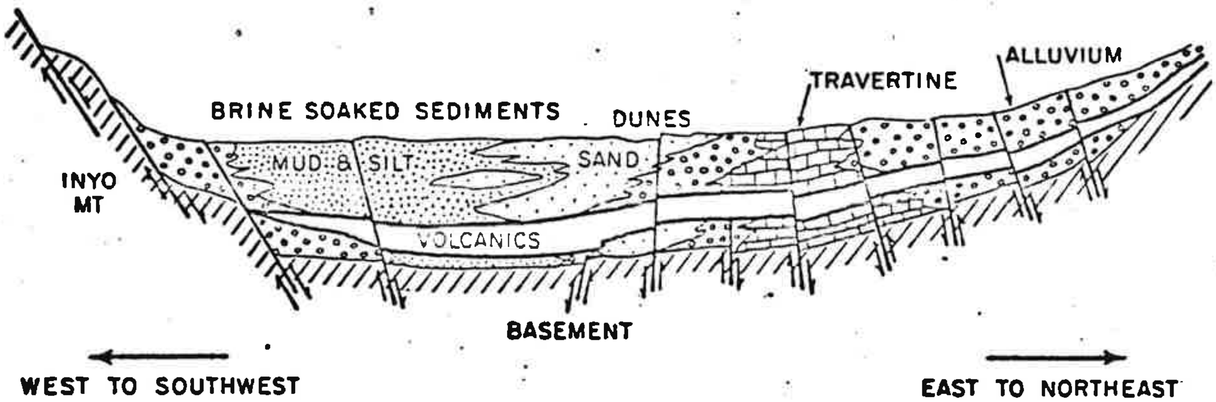


FIG. 11. Diagram of Saline Valley Salt Deposits. Some of the faults shown here have strike slip components (largely right-handed).

suggests a continuation of the Saline Range volcanic cover underlying the whole valley bottom. Possibly, there may be another brine body underlying the lowest portion of this subsurface volcanic layer (see Fig. 11).

Halite and thenardite (anhydrous sodium sulfate) compose 95 to 98% of the surface salts. The remaining 2 to 5% consists of gypsum, borates, and carbonates.

The percentage of halite in the surface salines is largely a function of the brine composition and the depth to the brine. In the southwest portion of the salt deposits, the surface consists of 98% sodium chloride, where the brine is not more than 3 inches below the surface (brine 3% sodium sulfate). In the northwest part, the surface salts are 98% sodium sulfate, and the depth to brine is 3 feet (brine 20% sodium sulfate). The thenardite area near sample 5 borehole is very hummocky, with pits 3

feet deep. Halite is found in the bottom of the pits. Halite is the principal mineral wherever the brine level is at the surface. A very shallow depth to brine favors deposition of relatively pure sodium chloride, because the brine is usually already saturated with it. Once a halite crust is formed, diffusion prevents saturation with other constituents, except on the east side and northwest corner, where the brine is saturated with both sodium chloride and sodium sulfate. A greater depth to brine favors a salt crust that is representative of the brine composition, because the brine reaches the surface by capillary action. Only rain and flooding (rare) oppose this process. The relatively pure thenardite around sample 5 borehole probably owes its purity to leaching by winter rains, because sodium sulfate is relatively insoluble in water below 20°C as compared with sodium chloride (Fig. 12).

The trace-element composition of the surface salts roughly parallels the trace-element composition of the brines, with the exception of iodine, which forms small grains of iodate minerals in the interspaces of the thenardite. The iodate minerals were detected by wetting the thenardite

(a) Looking east.

(b) Wash distributary, looking north.

(c) Looking southwest.

FIG. 12. Thenardite Area in the Valley.

with an acid brine containing iodide, which caused the iodine minerals to stand out as red-brown spots about 1 mm wide. More iodine is found in thenardite than in other saline minerals in the area.

Alkalies in the Brine. Lithium, potassium, and rubidium form local areas of concentration on the lake margins (Fig. 13). Hot springs are suspected of being the source of the lithium; however, the known hot springs are too distant to contribute any lithium to the lake (lithium is rapidly removed by clay minerals); hence, subsurface sources of thermal waters are suspected. For example, Vega Spring waters lose about 98% of their lithium in the 2 miles between the spring and the salt deposits. Hence, it is possible that the lithium "highs" in the sampled area originate from a thermal source somewhere below the surface to the east of the saline body. Travertine outcrops east of the salt deposits, and to the northeast in the Dry Mountain Quadrangle is an extinct geyser, hence considerable subsurface thermal activity is quite probable.

Potassium, lithium, and rubidium are subject to selective removal by clay, which accounts for their depletion in the lake's central portion. Continued influx of clay would prevent saturation of the clay minerals with respect to potassium and rubidium. The fact that the highest concentrations of potassium occur only on the lake margins where wind-blown sand is the principal clastic bears this out. The intrusion of potassium-poor waters on the south side comes from a large area of Permian limestones. Limestones are very poor in potassium, hence little potassium would be expected from this source.

The rubidium high at sample 5 borehole is traceable to the rubidium-rich Hunter and Vega Springs, whose waters show a 90% decrease in rubidium (relative to total solids) from the springs to sample B4 borehole, a distance of only 2 miles.

Borate, Sodium, Carbonate, and Sulfate in the Brine and pH of the Brine. Borax and sodium carbonate are generally derived from hot springs and the leaching of volcanics; and, as may be expected, the portions of the playa receiving drainage from volcanic and travertine areas are high in these substances. Carbonate and borate control the pH, as may be seen by comparing Fig. 14 and 15. One of the most important factors that controls trace-element distribution in the playa is the pH.

The source of sulfate is obscure; however, the maps suggest it may come from the leaching of contact metamorphic zones that are rich in sulfide minerals (Fig. 16).

Alkaline Earths. As may be expected, the alkaline earths are virtually absent in the high pH brine, but are the major constituents of the chalk-like muds on the lake margins. The steep concentration gradients of these elements (Fig. 17) appear to coincide with steep gradients of boron and sodium carbonate. Relatively high concentrations of strontium were found spectrographically; however, since the results were very qualitative, strontium data were not tabulated or mapped.

White Mountain Claims (Florence Mine). Location: On the east flank of the Inyo Range near the southern end of Saline Valley about 8 airline miles northeast of Keeler, in T. 16 S., R. 38 E., M.D.M. (projected). Ownership: 6 claims are owned by Sierra Talc and Clay Company, 5509 Randolph Street, Los Angeles, California. Leased by William Bonham, Lone Pine, California.

This property is one mile east of the White Mountain Mine and in the same canyon. The rock units, like those of the White Mountain mine, are principally limestone and dolomite with subordinate quartzite. Both the carbonate rocks and the quartzite have been altered to talc in numerous places. The talc is medium gray to light green and very blocky. It

appears to have formed principally along fractures. In only a few places is the talc in deposits large enough to be of commercial interest. The surface exposure of the largest of the area's known talc deposits is about 200 feet long and from five to ten feet wide.

The property is exploited by numerous open cuts, adits, and shallow shafts distributed through an area about one-half mile long and one-tenth mile wide. One 80-foot adit driven southeastward from the canyon wall intersects the 200-foot talc zone described above, at a depth of about 55 feet.

The total production from 1938 to 1948 was about 7000 to 8000 tons of talc. The property is still in operation.

White Mountain Mine. Location: About 8 miles northeast of Keeler, on the east slope of the Inyo Range, in T. 16 S., R. 38 E., M.D.M. (projected). Ownership: 3 patented claims are owned by Roy C. Troeger, 4600 Encino Avenue, Encino, California. Under lease to William Bonham, Lone Pine, California since 1938.

The White Mountain mine area is underlain principally by Paleozoic dolomite and limestone. Within these carbonate rocks are layers and irregular masses of siliceous rock of which most, if not all, is quartzite. The sediments have been invaded by numerous rhyolite dikes that commonly are partly to thoroughly chloritized. Much of the bedrock is hidden beneath mantle. The area has a very complex structure, including several northwest-trending faults.

Talc bodies have formed as alterations of both the carbonate and siliceous rocks. Many have formed along contacts between various rock types, others have formed along faults and fractures within individual lithologic units. Angular blocks of talc also are concentrated at the base of the mantle. Such concentrations have been worked in several places by shallow adits and trenches.

The White Mountain mine workings are confined to an area of approximately 30 acres, and consist of about 40 adits and numerous trenches and bulldozer cuts. Because none of the known White Mountain talc bodies are as large as the larger bodies at the Talc City mine, the White Mountain workings are comparatively shallow. Most of the adits are disconnected and none exceed a few hundred feet in length.

The White Mountain mine together with the neighboring Florence and Alberta mines have yielded a combined production to date of 20,000 to 25,000 tons of talc.

The property is active. (C47, p. 121)

No. 7

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION SEC.	T.	R.	B & M	REMARKS
	Cerro Gordo (Aries Consolidated, Armagh, Bluff, Boushey Silver, Ignacio, Morman, New Enterprise, Omega, Pagan, Santa Maria, Summit No. 2, Union)	W.C. Rigg and Associates, 595 East Channel Road, Santa Monica (1951)	12,13 23,24 18	16S 16S	38E 39E	MD MD	Class A. Type 1. Comprises 44 patented claims in the Inyo Range about 5 miles north of Keeler at an elevation of 8500 feet. Anglesite, cerussite, argentiferous galena, pyrite, smithsonite, sphalerite, and tetrahedrite occur in Devonian marble along steep, north and northwest fissures. Ore bodies plunge south in the plane of the fissures. The greatest vertical dimension of stopes was about 1000 feet. Developed by a 900-foot shaft with levels at 85, 200, 400, 550, 700, and 900 feet. A 200-foot winze from the 900-foot level north of the shaft extends to the 1000 and 1100-foot levels. A second winze 250 feet deep gave access to a 1030 and 1150 level south of the shaft. Total underground workings have been estimated as great as 30 miles. A large silver-lead production prior to 1877 is not recorded. Between 1911 and 1915 a large tonnage of oxidized zinc ore was recovered from the old silver stopes. Between 1943 and 1945 the Golden Queen Mining Co. shipped between 750 and 1000 tons of ore reported to assay 17.5% lead and 13.2 ounces of silver. In 1946, W.E. Rigg and Associates leased the property which they later bought in 1949. Several thousand feet of underground development and about 1170 feet of diamond drilling were carried out between the 200 and 550 levels in the vicinity of the China stope. Some ore was shipped but the property is now idle. The total production is estimated to be over $17,000,000. Recorded production since 1906 is over $6,000,000. (Chalfant 33:277-283; Crawford
	Cerro Gordo (continued)						94:24-25, 374; DeGroot 90:213-214; Eric 48:239; Goodyear 88:250; Hamilton 20:37; 22:48; Knopf 14:95-109; 18:106-116; Norman and Stewart 51:171, 58-59; Merriam 49:82; Newman 22:420; 23:30; Stewart 49:56; Tucker 21:284; 24:33; 20:185-187; 26:480-482; 34:311; 38:426,431-33, 470, pl. 3; Waring 19:90-92)
106	Royal (Cerro Gordo Extension & Spear)	Silver Spear Mining Corp., George Merritt, Pres., Santa Barbara (1951)	11,12 13,14	16S	38E	MD	Class C. Type 1. Thirty unpatented claims in the Inyo Range. Lead and zinc carbonate with some galena in 3 parallel veins in limestone. Developed by a 200-foot shaft, 800 feet of drifts and a 50-foot winze on the 200-level. The former owner was Cerro Gordo Extension Mining Co., c/o J.P. Hart, Box 157, Keeler (1937). Recorded production from 1909-37 totals over $30,000 in lead, zinc, silver, gold, and copper. (Eric 48:250; Norman and Stewart 51:79,185; Tucker 21:294; 26:497-498; 38:433-434, 470,478, pls. 3,4; Waring 19:106-107) (C53. p. 460

No. 8

The Cerro Gordo mining district is known above all for its yield of silver and lead, which reached a peak in 1874. From 1911 to 1919 carbonate zinc was likewise an important product. Gold and copper, recovered especially from certain of the siliceous ores in this district, were actually minor commodities and byproducts of lead and silver extraction.

Nonmetallic products of the region include salines and talc. For 60 years the salines were produced in various evaporating works near Keeler (Goodyear, 1888, p. 227; Gale, 1915, p. 253–264). Until about 1950 the Natural Soda Products Co. on the lakeshore south of Keeler produced soda ash and other byproduct salines. Salt shipments from Saline Valley via the 13-mile aerial tram were discontinued 20 or more years ago, and the tram and salt mills allowed to decay. Talc has been extensively prospected for in the southern Inyo Mountains. In recent years this commodity became the principal export (Page, 1951). The mill of the Sierra Talc Co. is at Keeler.

Other commodities for which prospecting has been done with indifferent success near Cerro Gordo are tremolite asbestos, beryllium, and tungsten. Whereas, like Darwin, the geologic environment of the southern Inyos appears favorable for tungsten, no such minerals have with certainty been recognized at Cerro Gordo. There is an unconfirmed report of scheelite in the Union tunnel.

Worthy of mention, though not in connection with gold, is the so-called Keeler gold mine and mill southeast of Keeler. During World War II this mill was reconditioned for concentration of tungsten ore from the Darwin district.

Since construction of the narrow-gage railroad in 1882–83, building-stone quarries have from time to time been worked in dolomite and marble along the west foot of the range. According to Knopf (1918, p. 123), stone from these quarries was used in construction of the Mills Building in San Francisco. Several Los Angeles buildings are said to have been faced with it (Merrill, 1903 p. 206–207; Hill, 1912). On the whole, the rock is too strongly fractured to provide good dimension blocks. Silurian dolomite at selected localities near Dolomite Station yields an attractive snowy-white product. After pulverizing, this material is currently shipped for use in terrazzo. Devonian limestone quarried at the Cerro Gordo mine has in recent years been transported by the tramline for commercial uses. The Union tunnel was used in the quarrying operation.

In past years a poor quality of red and green Triassic "slate" was quarried in Slate Canyon. It may have possible value for roofing granules. (PP408, p. 6)

No. 8

ESTELLE TUNNEL

Portal of the low-level Estelle or Dellaphene tunnel lies 1½ miles southwest of Cerro Gordo at altitude 6,080 feet, or 2,240 feet below the Belshaw shaft collar (pl. 1). The tunnel is virtually straight and bears approximately N. 70° E. toward the Morning Star mine. Begun in 1908 (Knopf, 1918, p. 116), the Estelle tunnel reached its present face 8,100 feet from the entry by 1923. This ambitious and costly exploration drive passes on the tunnel level through almost half the higher Inyo Range just above altitude 6,000 feet, revealing an illuminating stratigraphic and structure section. Mapping of the Estelle tunnel provides data especially pertinent to future interpretation of Cerro Gordo geology. Face of the Estelle tunnel is situated in depth beneath a point 3,100 feet horizontally S. 24° E. of the Belshaw shaft collar. Altitude at the face is about 6,160 feet, or 1,078 feet lower than the Cerro Gordo 1,100 level.

Practical objectives of this drive were threefold: (a) to cut and explore the Castle Rock vein, (b) explore inferred deep continuations of veins in and around the Morning Star mine a mile south of Cerro Gordo, (c) to explore by a northward drive in Estelle ground for downward extensions of the south-raking Jefferson chimney and other Cerro Gordo ore channels.

Production of the Estelle has been small. The record from 1916 to 1926 shows 2,700 tons of lead-silver ore valued at about $80,000 (Hanson, F. D., written communication, 1931). Average metal content reported is 0.016 ounce of gold per ton, 20.00 ounces of silver, 21 percent lead, and 0.7 percent copper (fig. 25).

Rocks through which the Estelle tunnel passes range downward from the upper part of the Keeler Canyon formation at the portal to the upper part of the Hidden Valley dolomite at the face. The Cerro Gordo fault brings Chainman shale into contact with the Hidden Valley; thus cutting out the Perdido, Tin Mountain, and the Lost Burro formations. East of the Cerro Gordo fault, the Lost Burro was encountered in the 800-foot raise above the Estelle tunnel level. A quartzite bed recognized on the 660 raise level is believed to represent zone A of the Lost Burro. Because of very heavy ground encountered in the weak Chainman shale almost continuous timber and lagging were required. (PP408, p. 64)

No. 9

Although the Morning Star mine has been active at various times since 1899, the production records are incomplete. Ore shipments totaling 4,127 tons are reported (F. D. Hanson, written communication, 1931) for the years from 1920 to 1931. Value of these shipments at the smelter is said to have been $107,145. Average assay is recorded as about 0.30 ounce of gold per ton, 31 ounces of silver per ton, 5 percent lead, 1 percent copper, and 3 percent zinc. A higher gold assay than would otherwise be expected is accounted for by averaging in production from the Gold Stope. Gold Stope ores are reported to have averaged about 0.80 ounce of gold per ton (F. D. Hanson, written communication, 1931). Ores from other sections of the mine seemingly ran less than 0.15 ounce of gold per ton. (PP408, p. 64) No. 9

INYO COUNTY (CONT.)

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION SEC.	T.	R.	B & M	REMARKS
59	Estelle and Morning Star. (Riff Raff, Sure Contest, Troeger's)	Estelle Mining Corp. Walter Davis, pres. Roy L. Troeger, sec. 4600 Encino Ave., Encino	23, 24, 26	16S	38E	MD	Class A, Type 2. A total of 71 claims on the west slope of the Inyo Range near Keeler. Argentiferous galena in limestone. Developed by 2500 feet of underground workings on 7 levels from a 1100-foot shaft, 8300-foot adit, and 500-foot tunnel. Total workings including old drifts estimated to be about 20 miles. Large lead-silver-zinc production, with appreciable copper and gold, between 1916 and 1937. Between 1924 and 1938 production in part was from the Estelle. (Eric 48:242; Knopf 14:110; 18:116-17; Newman 23:421; Norman and Stewart 51:69-70,175; Tucker 21:286; 24:187-89; 26:483-84; 38:437-440, 472, pl. 3, 4; Waring 19:108-09)
	Estelle and Morning Star (continued)						

(C53, p. 470)

Andalusite
(Chiastolite)

A chiastolite form of andalusite occurs widely in contact-metamorphosed Rest Spring shale. It forms roughly rectangular grains commonly 3 to 5 mm long and a millimeter in diameter. It is a greenish gray sufficiently translucent to appear dark gray like the enclosing hornfels, or the grains are white from alteration to sericite and kaolinite. The white grains show most clearly the symmetric concentration of dark carbonaceous particles along diagonal planes and squarish cores, making the distinctive chiastolite patterns. The optical properties are normal for andalusite. The matrix, which is not foliated, consists of fine-grained quartz, biotite, and much carbonaceous material. The most accessible occurrence of chiastolite is along the San Lucas Canyon road near the junction with the road to Cerro Gordo mine.

(CSR42, p. 53)

No. 10

BELMONT MINE

The Belmont workings, now largely inaccessible, lie on the south side of Belmont Canyon and comprise several tunnels driven southeastward into Tin Mountain limestone and contiguous quartz monzonite. The principal workings enter a body of Tin Mountain limestone, about 750 feet long. This Tin Mountain is largely enclosed by the intrusive body and is partly altered to calc-silicate rock with garnetized seams. Some of the mine openings are near or on intrusive contacts. According to Goodyear (1888, p. 250-251) most of the Belmont ore was mined from quartz veins within the quartz monzonite itself, as was true likewise of the Newsboy mine. The main Belmont vein appears to have had a northwesterly trend and southwesterly dip of 60° to 70°. Argentiferous quartz veins of this mine contain calcite, galena, pyrite, chalcopyrite, tetrahedrite, and copper-bearing minerals derived by oxidation of the primary sulfides. Goodyear (1888, p. 252) reports native silver. Old furnace ruins nearby attest to early reduction attempts at the mine. Most of the ore was hand sorted for transportation by mule to the Cerro Gordo smelters. According to Goodyear, as much as 100 tons per month reached Cerro Gordo in 1870. Better grades of Belmont ore are said to have carried 165 ounces of silver per ton, valued at about $190. Rather large volume of the dumps indicates that the Belmont workings were extensive and suggests that a considerable part of the Cerro Gordo fluxing ores could well have been obtained here (Raymond, 1873, p. 18). (PP408, p. 78)

No. 11

INYO COUNTY (CONT.)

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION SEC.	T.	R.	B & M	REMARKS
34	Belmont	W. L. Hunter Estate Olancha (1947)	19	16S	39E	MD	Class D, Type 1. High-grade silver ore with some lead and copper in quartz veins. Worked by adit and shaft totaling over 3600 feet of underground development. A reported production of $500,000. (Crawford 94:23; 96:32; Eric 48:238; Goodyear 88:250-254; Norman and Stewart 51:169; Tucker 21:283; 26:477; 38:428,468, pl. 3)

(C53, p. 453)

No. 11

Lippincott Lead Mine (Lead King). Location: 4 miles south of Ubehebe Peak in sec. 13, T. 15 S., R. 40 E., M.D.M. (projected) and 32 miles by road south of Ubehebe Crater. Ownership: 12 unpatented claims are owned by George Lippincott, P. O. Box 1811, Santa Ana, operating the Lippincott Lead Company.

The Lippincott lead deposits, according to McAllister,[108] characteristically resemble pods and pipes in siliceous veins which cut Paleozoic dolomite, although some of the ore shoots have replaced the dolomite along minor faults and in brecciated zones. Galena and cerussite, the chief lead-ore minerals, are in a gangue of quartz and chalcedony. Zinc, in the minerals smithsonite and sphalerite, and silver disseminated through the galena are also recovered; contemporaneous deposits of copper, iron, tungsten, and talc were formed in the dolomite by the intrusion of a quartz monzonite stock, but are of low grade and have not been exploited.

The dolomite and overlying sedimentary rocks are folded into an inverted overturned syncline, which to the east becomes a fault. Another fault, nearly parallel to the western margin of the area, intersects a northwest-trending shear zone. Minor faults, trending north and northwest, are probably related to this shear zone and have controlled the lead deposits.

An adit, called the "main tunnel," was started 100 feet west of the camp at an altitude of 3750 feet, and was driven for a distance of 625

[107] Major, R. E., personal communication, June 1950.
[108] McAllister, James F., Geology of the Lippincott lead area, Inyo County, California: U. S. Geol. Survey, Prelim. Rept., September, 1949.

feet S. 45° W. A 50-foot drift was run southeast along a narrow mineralized seam 125 feet from the portal. About 250 feet from the portal, drifts 125 feet and 105 feet long have been driven northwestward and southeastward respectively. From the southeast drift, a pipelike orebody plunging N. 70° W. was mined to the surface; the orebody extends 200 feet or more down plunge and reaches a maximum diameter of 14 feet. A 60-foot winze was sunk below the tunnel level 30 feet southwest of the tunnel. Approximately 1000 tons of ore, mined from an orebody 6 inches to 14 feet wide and assaying 42 percent lead and 8 ounces silver, has been shipped from these workings.

Confidence No. 2 tunnel, 800 feet S. 25° E. of the main tunnel at an altitude of 4000 feet, was driven S. 17° W. for a distance of 145 feet. Seventy-five feet from the portal, a 40-foot winze was sunk. Approximately 50 tons of ore was shipped from here. Johnson tunnel, started 200 feet S. 69° E. from Confidence No. 2 tunnel at the same altitude, was run S. 36° W. a distance of 240 feet for prospecting purposes.

The Taylor shaft, 50 feet west of the Johnson tunnel, is inclined 65° NW. It reached a depth of 135 feet following an orebody which averaged 2 feet in width. Four hundred tons of ore was shipped from the shaft and a raise; the assays of the ore showed a range of 17 to 40 percent lead. The maximum zinc and silver content was 20 percent and 105 ounces respectively. Lippincott states that the relationship of high silver to high zinc content is typical of the ore.

In the Addison shaft, started 775 feet southwest of the Confidence No. 2 tunnel at an elevation of 4900 feet, an orebody 125 feet long and inclined 40° NW. was mined.[109] Production from this orebody, 1 foot to 3 feet wide, amounted to $35,000 worth of ore; some shipments assayed as much as 63 percent lead and 36 ounces of silver per ton.

The value of 2000 tons of ore produced to date from the mine was $80,000. Assays of the shipments showed the quality of the ore to range as follows: 25-40 percent lead, 11-38 ounces silver, and 4-11 percent zinc. The inaccessibility of the mine has made it unprofitable to ship lower-grade ore. At present, all ore is treated at the Lippincott Lead Company smelter at Santa Ana, California. Previously, a considerable amount of the ore was shipped to other smelters and custom plants.

Equipment at the mine includes one 250 and one 135 cubic feet per minute diesel compressors, a D-4 Caterpillar bulldozer, diesel light plant and modern camp facilities. The nearby Racetrack plaza is utilized as a landing field for airplanes. Three men are employed.

(C47, p. 73,74)

No. 12

Relatively undeveloped [talc] deposits that appear to have substantial reserves exist at the * * *Ubehebe mine in the northern Panamint Range.

(C176, p. 629)

No. 13

279	Ubehebe	Sierra Talc and Clay Co., 5509 Randolph St., Los Angeles	—	15S	41E	MD proj.	Steatite grade talc in limestone and dolomite. Worked by adits, intermittently before 1945. C47, p. 218

No. 13

U.S. GEOLOGICAL SURVEY

LAND USE DATA AND ANALYSIS PROGRAM

The Land Use Data and Analysis (LUDA) Program will provide a systematic and comprehensive collection and analysis of land use and land cover data on a nationwide basis. The initial nationwide collection of these data will be completed within a four- to five-year period. Individual land use-land cover maps and their associated data will be released as they become available following compilation. Periodic revision of the data is planned.

Specific products to be provided by the Land Use Data and Analysis Program are:

1. Maps at 1:250,000 scale showing the present land use and land cover at Level II of a land use/cover classification system developed by the U.S. Geological Survey in conjunction with other Federal and State agencies and other users. For each of the land use-land cover maps produced, overlays will also be compiled showing Federal land ownership, river basin and subbasins, counties, and census county subdivisions. State land ownership will be shown when information is made available to the U.S. Geological Survey by the appropriate state agency or agencies on a statewide basis.

   Land use and land cover data will be keyed to the combined black and blue color separation plates of the standard USGS 1:250,000 topographic sheets. The minimum mapping unit for urban and built-up uses, water areas, confined feeding operations, other agricultural land, and strip mines, quarries, and gravel pits will be 10 acres. All other categories will be delineated with a minimum unit of 40 acres. Federal land holdings will be shown for tracts of 40 acres or larger and state land holdings will be similarly delineated when data are available from appropriate state agencies.

2. Selected experimental demonstration land use and cover maps at 1:24,000 or 1:50,000 scale will also be prepared in order to show how land use and cover mapping at a regional scale such as 1:250,000 can be related to more detailed land use and cover mapping at larger scales.

3. Computerized graphic displays and statistical data on current land use and cover will become available through this program for use in conjunction with other data. Statistical data will be compiled by counties for areas of Federal ownership, river basins and subbasins, and by statistical units such as census tracts or other census county subdivisions.

(over)

Land use and land cover data will be digitized in polygon format (each individual land use/cover area comprising a polygon). Conversion of land use polygons to land use grid cells of varying sizes can be made when desired.

Because of the dynamics of land use, the emphasis in the preparation and distribution of all products will be on supplying the information to the users in the shortest possible time. Applied research in data and information requirements, inventory methods, and data use, as well as interpretative studies will also be carried out under the program in order to supply needed current land use and land cover data for land use planning, resource management, and other purposes.

The program will use the advanced technology at the Special Mapping Center of the U.S. Geological Survey, high altitude NASA photographs, aerial photographs acquired for the USGS Topographic Division's mapping program and ERTS data.

Further information on the status of land use and land cover mapping and the availability of maps and data may be obtained from the Chief Geographer, U.S. Geological Survey, Mail Stop 115, Reston, Virginia 22092 (telephone: (703) 860-6344). (FTS: 8-928-6344)

U.S. GEOLOGICAL SURVEY
LAND USE AND LAND COVER CLASSIFICATION SYSTEM FOR USE WITH REMOTE SENSOR DATA

	LEVEL I		LEVEL II
1	Urban or Built-up Land	11	Residential
		12	Commercial and Services
		13	Industrial
		14	Transportation, Communications and Utilities
		15	Industrial and Commercial Complexes
		16	Mixed Urban or Built-up Land
		17	Other Urban or Built-up Land
2	Agricultural Land	21	Cropland and Pasture
		22	Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas
		23	Confined Feeding Operations
		24	Other Agricultural Land
3	Rangeland	31	Herbaceous Rangeland
		32	Shrub and Brush Rangeland
		33	Mixed Rangeland
4	Forest Land	41	Deciduous Forest Land
		42	Evergreen Forest Land
		43	Mixed Forest Land
5	Water	51	Streams and Canals
		52	Lakes
		53	Reservoirs
		54	Bays and Estuaries
6	Wetland	61	Forested Wetland
		62	Nonforested Wetland
7	Barren Land	71	Dry Salt Flats
		72	Beaches
		73	Sandy Areas Other than Beaches
		74	Bare Exposed Rock
		75	Strip Mines, Quarries, and Gravel Pits
		76	Transitional Areas
		77	Mixed Barren Land
8	Tundra	81	Shrub and Brush Tundra
		82	Herbaceous Tundra
		83	Bare Ground Tundra
		84	Wet Tundra
		85	Mixed Tundra
9	Perennial Snow or Ice	91	Perennial Snowfields
		92	Glaciers

APPENDIX III

PALEONTOLOGIC RESOURCES OF THE SALINE VALLEY PLANNING UNIT

Prepared for the
Bureau of Land Management
by

Patrick J. Kennedy
February, 1977

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GENERAL INTRODUCTION

The rocks of the Saline Valley Planning Unit consist of widespread units of quartzite, siltstone, shale, limestone and dolomite. These rocks represent a complete stratigraphic sequence of Precambrian, Paleozoic and lower Mesozoic rocks. This sequence is initiated by a series of late Precambrian sediments and continues through the Paleozoic into rocks of Triassic age.

An abundance of paleontologic data has been recovered from the Saline Valley and associated areas (Appendices A and B). This abundance of fossil material coupled with the continuity of the stratigraphic record make this a paleontologically significant area.

PURPOSE

This report constitutes a literature search of all the existing geologic, paleontologic and stratigraphic data from the Saline Valley area. The purpose of this report is to determine the significant paleontologic resources found within the Saline Valley Planning Unit.

PREVIOUS WORK

The Saline Valley area was first reconnoitered by Ball (1907) in a geological reconnaissance of Nevada and eastern California. An initial attempt at constructing the stratigraphy of this area was made by Kirk (1918) as part of a geological reconnaissance of the Inyo Range and the eastern slope of the Sierra Nevada (Knopf, 1918).

In recent years much of the Saline Valley area has been studied

by numerous individuals. The geology and mineral deposits of the Ubehebe Peak quadrangle and north Panamint Range were reported on by McAllister (1952 and 1955). Merriam (1963) published the geology of the Cerro Gordo area. The geology of the Dry Mountain quadrangle was published by Burchfiel (1969).

A full list of references for the Saline Valley Planning Unit and associated areas can be found at the end of this report.

STRATIGRAPHY

In 1970 Stewart (1970) described the regional stratigraphy of the southern Great Basin. He divided this area into three regions having separate stratigraphic nomenclatures. Two of the three regions described by Stewart (1970) are present in the Saline Valley Planning Unit. These two regions are here referred to as western and eastern. The western region includes the Inyo Mountains. The eastern region (central region of Stewart) includes the Last Chance, Saline and Panamint Ranges.

The regional stratigraphy presented by Stewart (1970) dealt only with Precambrian and lower Cambrian strata. It is apparent, however, that this division can be extended to include correlative strata of Ordovician, and upper and middle Cambrian age (figure 1).

Detailed descriptions of the formations found within the Saline Valley Planning Unit can be found in Appendix A of this report.

PALEONTOLOGY

The paleontology of the western region is best known from

		WESTERN REGION	EASTERN REGION
PERM.		OWENS VALLEY FORMATION	OWENS VALLEY FORMATION
CARBON.	PEN.	KEELER CANYON FORMATION	KEELER CANYON FORMATION
CARBON.	MISS.	REST SPRING SHALE.	REST SPRING SHALE.
CARBON.	MISS.	PERDIDO FORMATION	PERDIDO FORMATION
CARBON.	MISS.	hiatus	TIN MOUNTAIN LIMESTONE
DEV.		LOST BURRO FORMATION	LOST BURRO FORMATION
SIL.		HIDDEN VALLEY DOLOMITE	HIDDEN VALLEY DOLOMITE
ORD.		ELY SPRING FORMATION	ELY SPRING FORMATION
ORD.		JOHNSON SPRING FORMATION	EUREKA QUARTZITE
ORD.		BARREL SPRING FORMATION	EUREKA QUARTZITE
ORD.		BADGER FLAT FORMATION	POGONIP GROUP
ORD.		AL ROSE FORMATION	POGONIP GROUP
U.Є.		TAMARACK CANYON DOLOMITE	NOPAH FORMATION
U.Є.		LEAD GULCH FORMATION	NOPAH FORMATION
M.Є.		BONANZA KING FORMATION	BONANZA KING FORMATION
M.Є.		MONOLA FORMATION	CARRARA FORMATION
L.Є.		MULE SPRING FORMATION	CARRARA FORMATION
L.Є.		SALINE VALLEY FORMATION	ZABRISKE QUARTZITE
L.Є.		HARKLESS FORMATION	WOOD CANYON FORMATION
L.Є.		POLETA FORMATION	WOOD CANYON FORMATION
L.Є.		CAMPITO FORMATION	WOOD CANYON FORMATION
PЄ		DEEP SPRING FORMATION	WOOD CANYON FORMATION

FIG. I PALEOZOIC ROCKS OF THE SALINE VALLEY AREA

Mazourka Canyon which is located on the west side of the Inyo Mountains outside of the Saline Valley Planning Unit. The paleontology of Mazourka Canyon has been intensively studied and is the subject of several on-going investigations. (Alpert, Miller, Paden, Ross, and others.)

The paleontology of the eastern region is best known from the rocks of the north Panamint Range (McAllister, 1952 and 1955). Little is known of the paleontology of the Saline Valley itself.

The potential for the study of the paleontology in this area is substantial. However, a detailed mapping of the area must be completed before the proper stratigraphic control necessary for a meaningful paleontologic study can be achieved.

It is suggested that this area remain open to geologists and that paleontologic studies be encouraged.

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APPENDIX A

FOSSILIFEROUS ROCKS OF THE

SALINE VALLEY PLANNING UNIT

Deep Spring Formation - Kirk (1918)

Age: Precambrian

Lithology: Dolomites, quartzite and calcareous sandstone.

Fossils: Mollusca

Wyattia

Algae

algae

Trace fossils

Rusophycus
Cruziana

Body fossils

Pteridinium

Wood Canyon Formation - Nolan (1929)

Age: Lower Cambrian and Precambrian

Lithology: The Wood Canyon Formation is divided into three members of regional extent: a lower member composed of siltstone and fine-grained quartzite and minor amounts of dolomite;

Fossils: Trilobites

Olenellid trilobites
Wanneria (?) gracile
Nevadella gracile (?)
Nevadella cf. N. addeyensis

Gastropoda

Hyolithes

Sponge-like fossils

Archeocyathids

Trace fossils

Scolithus

Campito Formation - Kirk (1918)

Age: Lower Cambrian and Precambrian

Lithology: Gray shale and interbedded fine grained quartzite, siltstone and sandstone, most typical of the basal portion; massively bedded, locally cross-stratified, dark gray to black quartzitic sandstone and interbedded gray siltstone and shale is most typical of the upper beds.

Fossils: Trilobites

Nevadia
Holmia
Laudonia
Judomia (?)
Fallotaspis
Daguinaspis

Sponge-like fossils

Archeocyathids

Trace fossils

Trails

Poleta Formation - Nelson (1962)

Age: Lower Cambrian

Lithology: Massive to thick bedded gray-blue limestone with abundant archiocyathids, some in reef form, most typical of the basal portion; gray-green shale, mottled blue-gray limestone beds; Scolithus (worm borings) bearing quartzite, most typical of the upper beds.

Fossils: Trilobites

Ptychoparids
Judomia (?)
Fremontia
Laudonia
Nevadella
Holmia

Echinoderms

Helicoplacus
Eocystites

Sponge-like fossils

Archeocyathids

Trace fossils

Scolithus

Harkless Formation - Nelson (1962)

Age: Lower Cambrian

Lithology: Quartzite, siltstone and shale (commonly metamorphosed to coarse shimmering mica schist). Quartzite weathers red to brown. Shale commonly greenish-gray where less metamorphosed.

Fossils: Trilobites

Paedeumias
Bonnia

Sponge-like fossils

Archeocyathids

Zabriskie Quartzite - Wheeler (1948)

Age: Lower Cambrian

Lithology: pinkish-gray fine to medium grained vitreous cliff-forming quartzite

Fossils: Trace Fossils

Scolithus (?)

Saline Valley Formation - Nelson (1962)

Age: Lower Cambrian

Lithology: Limestone and abundant siliceous and argillaceous layers. Contains rounded sand grains in limestone matrix near middle. To south, sand-size clastic material increases and commonly contains calcareous cement.

Fossils: Trilobites

Ogygopsis
Bonnia
Olenoids
Zancanthopsis

Carrara Formation - Cornwall and Cleinhampl (1961)

Age: Lower and Middle Cambrian

Lithology: The Carrara Formation is a hetrogeneous sequence of olive-gray and greenish-gray siltstone and shale and medium gray limestone in the lower half, and medium gray limestone and yellowish-brown silty limestone and limy siltstone in the upper half.

Fossils: Trilobites

Olenellus
Wenkchemnia
Stephenaspis
Kochaspis
Plaguria
Albertella
Glossopleura

Algae

Girvanella

Mule Spring Limestone - Nelson (1962)

Age: Lower Cambrian

Lithology: Limestone; contains Girvanella (?) locally. Weathers gray.

Fossils: Trilobites

Olenellus
Paedeumias
Bonnia
Onchocephalus
Bristolia
Fremontia

Algae

Girvanella (?)

Monola Formation - Nelson (1965)

Age: Middle Cambrian

Lithology: Limestone, siltstone, and shale, thinly interbedded. Weathers brown.

Fossils: Trilobites

Glossopleura
Obygopsis
Alokistocare
Syspacephalus
Oryctocephalus

Bonanza King Formation - Hazzard and Mason (1936)

Age: Upper and Middle Cambrian

Lithology: Dolomite, varied shades of gray; colorbanded ("zebra striped"). Contains Girvanella? near base-

Fossils: Algae

Girvanella?

Nopah Formation - Hazzard (1937)

Age: Upper Cambrian

Lithology: Light and dark gray dolomite; shaly limestone in basal unit.

Fossils: Brachiopoda

Lingula sp.
Obolus sp.
Acrotreta cf. A. idahoensis Walcott
Linnarssonella girtyi Walcott
Linguloid fragments
minute acrotretid brachiopods

Trilobites

Elvinia sp.
Aphelaspis sp.
Pterocephalia?

Gastropoda

Matherella cf. M. saratogensis Walcott
Sinuopea (3 or 4 species)
Strepsodiscus sp.

Lead Gulch Formation - Ross (1963)

Age: Upper Cambrian

Lithology: The Lead Gulch Formation has a varied lithology of limestone, siltstone, dolomite, chert and shale in a regularly layered sequence of beds from ½ to 5 inches thick. Dominant are distinctive outcrops of blue-gray to medium gray limestone and thinly laminated siltstone that weathers in relief to bright orange and reddish tints. Olive-brown to dark green shale, or its metamorphic equivalent, is as thick as 20 feet at the base of some sections.

Fossils: Trilobites

Homagnostus
Pseudagnostus

Brachiopoda

acrotretid brachiopods

Tamarack Canyon Dolomite - Ross (1963)

Age: Upper Cambrian

Lithology: Laminated to thick beeded very light-gray to medium gray dolomite. Weathers normally to a monotonous gray surface.

Fossils: None reported.

Pogonip Group - King (1878)

Age: Ordovician and Cambrian

Lithology: Dolomite and limestone; some shale; chert, and sandy or quartzitic beds.

Fossils: Brachiopoda

*Palliseria longwelli (Kirk)
Porambonites sp.
Archaeoorthis costellata Ulrich and Cooper

Trilobites

Kainella (?) finalis (Walcott)
Bellfontia sp.
Hystricurus tuberculatus (Walcott)

Gastropoda

*Maclurites sp.

Sponge

*Receptaculites sp.

Al Rose Formation - Ross (1963)

Age: Ordovician

Lithology: Siltstone, mudstone, shale, small amounts of limestone, and some chert. Contains graptolites and trilobites near top. Weathers brown.

Fossils: Trilobites

Ampyxinid trilobite
Olenid aff. Parabollinella
Asphid?, indeterminate
Shumardia sp.
Indeterminate agnostid trilobite
Indeterminate trilobite thorax and pygidium
Trilobite pygidium, Kainellid or apatokephelid, poorly preserved.
Indeterminate asaphid trilobite thorax and pygidium

Graptolites

Phyllograptus cf. P. ilicifolius Hall
Didymograptus protobifidus Elles
Didymograptus artus Elles and Wood
Didymograptus protobifidus Elles
Tetragraptus bigsbyi Hall
Phyllograptus anna Hall

Badger Flat Limestone - Ross (1963)

Age: Ordovician

Lithology: Silty limestone containing irregular siltstone lenses. Contains black chert nodules and nodular beds. Fossils abundant. Weathers blue-gray.

Fossils: Brachiopoda

Orthambonites? mazourkaensis (Phleger)
Orthambonites? patulus (Phleger)
Rhysostrophia nevadensis Ulrich and Cooper
Physostrophia n. sp.

Coral

massive favositoid coral

Gastropoda

unidentifiable gastropods

Cephalopoda

Reudemannoceras sp.
Rossoceras sp.

Trilobites

Pseudomera? sp.
trilobite pygidia - unidentifiable generically, but obviously a bathyurid.
Isotelus-like trilobite

Echinoderms

Cystid plates, showing hydrospires

Sponge

Sponges

Bryozoa

Two genera but indeterminate

Conodonts

Conodonts, undetermined

Eureka Quartzite - Hague (1883)

Age: Ordovician

Lithology: Upper part, massive vitreous nearly white quartzite; lower part, ferruginous and some white shaly quartzite.

Fossils: None reported.

Barrel Spring Formation - Phleger (1933)

Age: Ordovician

Lithology: The Barrel Spring Formation consists of three members. A basal unit of sandstone and limestone is overlain by a medium-gray nodular bedded limestone, which contains abundant light-brown-weathering silty lenses. The upper member is a dark gray shale and mudstone and forms a most distinctive reddish-brown-weathering unit.

Fossils: brachiopods
trilobites
graptolites

Johnson Spring Formation - Pestana (1960)

Age: Ordovician

Lithology: Quartzite, limestone, dolomite, siltstone, and shale in intermixed sequence. Thins to north and percentage of quartzite decreases to the north. Corals locally abundant in limestone.

Fossils: Brachiopoda

Dinorthid, smooth, indeterminate
aff. Nicollella sp.
Zygospira sp.
Sowerbyella merriami Cooper
Sowerbyella sp.
Sowerbyella? sp.
Desmorthis? sp.

Coral

Streptelasmid corals
Paleophyllum? sp.
Lichenaria sp.
Paelophyllum sp.
"Streptelasma" tennysoni Pestana
Streptelasmatid corals
horn corals, indeterminate
Favistella sp.

Sponge

Receptaculitid fragments

Ely Spring Dolomite - Westgate and Knopf (1932)

Age: Ordovician

Lithology: Dolomite, thin to thick-bedded. Chert abundant in lower and upper part, absent in middle. Thins to the north; upper and lower parts grade into massive chert.

Fossils: Brachiopoda

Thaerodonta sp.
Lepidocyclus (two species)
Platystrophia sp.
Onniella cf. O. quadrata Wang

Zygospira n. sp.
Strophomena sp.
Plaesiomys sp.
Resserella sp.
Dinorthis aff. D. subquadrata (Hall)
Rhynochotrema aff. R. capax (Conrad)
Rhynchotrema cf. R. argerturbium (White)
Zygospira cf. Z. modestus (Say)
Glyptorthis cf. G. insculpta (Hall)

Coral

Halysites (Catenipora) sp.
Columnaria cf. C. alveolata (Goldfuss)
*Streptelasmid corals (several types)
Heterorthis sp.
Streptelasma sp.
Halysites sp.

Hidden Valley Dolomite - McAllister (1952)

Age: Devonian and Silurian

Lithology: Medium gray and very light gray dolomite; abundant nodular chert in lowest part.

Fossils: Brachiopoda

Acrospirifer kobehana (Merriam)
Meristella robertsensis Merriam
*Atrypa cf. A. reticularis
Parmorthis sp.
Rhipidomella sp.

Coral

*Favosites sp.
Papiliophyllum elegantulum Stumm
Breviphyllum lonensis (Stumm)
Breviphrentis invaginatus (Stumm)
*Heliolites sp.
*Halysites (Cystihalysites) sp. aff. H. catenularia var. simplex Lambe
*Halysites (Halysites) sp. of medium size
*Halysites sp. aff. H. catenularia var. micropora Whitfield
Alveolites? sp.
Tryplasma sp.
Porpites aff. P. porpita
*Halysites sp.
unidentifiable cup corals

branching Cladopora
zaphrentid horn coral
cyathophyllid horn coral
coral superficially resembling Cladopora
phaceloid rugose coral
"acanthocyclid coral with fossulae

Gastropoda

Platyceras sp.

Bryozoa

bryozoan fragments

Lost Burro Formation - McAllister (1952)

Age: Devonian

Lithology: Light and dark gray dolomite and limestone: thin sandstones at top and bottom. Sandy or quartzite basal unit.

Fossils: Brachiopoda

*Cyrtospirifer cf. C. monticola (Haynes)
Cyrtospirifer cf. C. disjunctus (Sowerby)
Tylothyris? cf. T.? raymondi Haynes
"Camarotoechia" aff. "C." duplicata (Hall)
Cleiothyridina cf. C. devonica Raymond
Productella sp.

Tin Mountain Limestone - McAllister (1952)

Age: Mississippian

Lithology: Conspicuously dark gray limestone, shaly in lower part; some chert nodules and lenses.

Fossils: Brachiopoda

*Triplophyllites
Chonetes cf. C. loganensis Hall and Whitfield
Schuchertella cf. S. chemungenis (Conrad)
Orthotetes inflatus (White and Whitefield)
Productus sp.
Spirifer cf. S. centronatus Winchell
Spirifer cf. S. missouriensis Swallow
Spirifer? sp. indent.
Spirifer or Brachythyris sp. indent.

Schumardella? sp. indent.
Composita? sp. indent.
Productella? sp. indent.
Schizophoria? sp. indent.
Punctospirifer? sp. indent.
*Brachythyris sp. A

Coral

Aulopora sp.
Syringopora sp.
Ekvasophyllum n. sp. (Ekvasophyllum Parks, 1951)
*Caninia sp.
horn coral

Gastropoda

Euomphalus cf. E. utahensis Hall and Whitfield
Straparolus? cf. S. ophirensis Hall and Whitfield
Platyceras sp. (possibly two small species)

Echinoderms

Crinoidal material
Crinoidal columnals
Echinoid plates

Perdido Formation - McAllister (1952)

Age: Mississippian

Lithology: Variety of coarse clastic rocks, siltstone and shale. Chert and quartzite clasts common. Calcareous quartz sandstone abundant. Weathers gray to reddish-gray; forms distinct outcrops.

Fossils: Brachiopoda

Strophomenoid? brachiopod indent.
Reticulariina sp. indent.
*Triplophyllites sp.
Spirifer cf. S. brazerianus Girty, or cf. S. grimesi Hall
Spirifer cf. S. pellaensis Weller
Spirifer missouriensis Swallow
Echinochonchus sp.
Dictyoclostus sp.
Composita cf. C. sulcata Weller

Coral

Hapsiphyllum? sp. indent.

Homalophyllites? sp. indent.
Cyathaxonia? sp. indent.
Caninia cf. C. cornicula (Miller)
other small zaphrentoid corals
horn coral indent.

Trilobites

Kaskia cf. K. chestcrensis Weller and Weller

Pelecypoda

Deltopecten sp.

Echinoderms

crinoid columnals

Rest Spring Shale - McAllister (1952)

Age: Mississippian

Lithology: Dark gray shale and siltstone, commonly metamorphosed to andalusite hornfels. Contains cravenocerid goniatites near middle. Weathers dark reddish-brown.

Fossils: Bryozoan

Fenestella sp.

Brachiopoda

Chonoted indent.
Heteralosia (?) sp.
Semicostella (?) sp.
Inflatia (?) sp. indent.
Flexaria sp.
Linoproductus (?) sp.
Spirifer aff. S. increbeseens Hall
*Spiriferoid, indent.

Gastropoda

Gastropod, indent.

Pelecypoda

*Pelecypods, indent.

Cephalopoda

*Goniatites, indent. (evolute form)

Echinoderms

crinoid plates
crinoid columnals

Misc.

*fossil plant

Keeler Canyon Formation - Merriam and Hall (1957)

Age: Permian and Pennsylvanian

Lithology: Limestone, commonly clastic, thinly interbedded with hornfelsed dark-colored shale and siltstone. Contains spherical black chert nodules ("golf balls") near base. Weathers gray; thinly striped.

Fossils: Foraminifera

Schwagerina
*Triticites
*Fusulinella
Minerella

Owens Valley Formation - Merriam and Hall (1957)

Age: Permian

Lithology: Hornfelsed silty and marly beds overlain by coarse clastics; the clasts range in size from sand to cobbles and consist dominately of quartzite and chert. Weathers red to brown.

Fossils: Brachiopoda

*Punctospirifer pulcher (Meek)
*Spirifer pseudocameratus (Grity)

Foraminifera

*Parafusulina
*Schwagerina
*subordinate Parafusulina
*Triticites

Coral
*Heritschia

Gastropoda

*Omphalotrochus

Triassic Marine (Un-named) - Merriam (1963)

Age: Early Middle and Early Triassic

Lithology: Upper reefy limestone -
Platy limestone and shale with thick reef - like lenses of massive limestone which weather out prominently.

Middle shale-limestone -
Gray fissle and platy shale with dark-gray limestone interbeds; poorly preserved amminoids in limestone beds and concretions.

Lower brown-mottled limestone -
Brownish-gray mottled silty nodular poorly bedded limestone; contains Ussuria and abundant minute gastropods.

Fossils: Cephalopoda

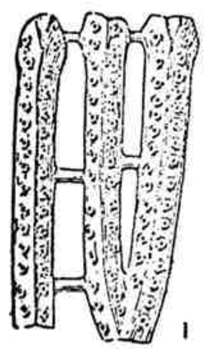
Parapopanoceras
Meekoceras
Ussuria

APPENDIX B

ILLUSTRATIONS OF FOSSILS FOUND IN

SALINE VALLEY PLANNING UNIT

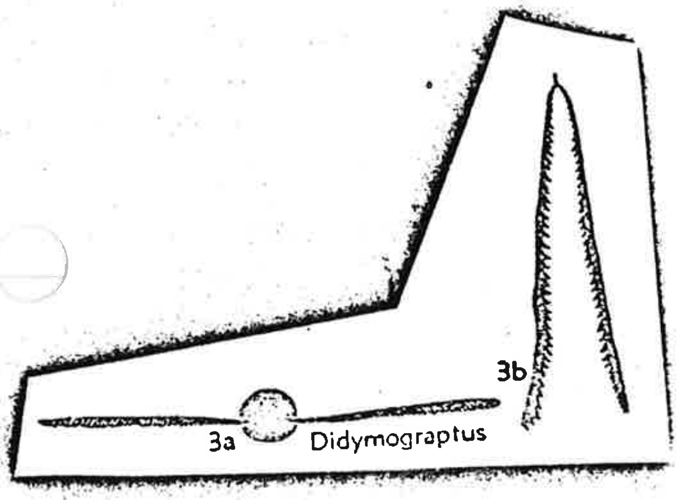
BRYOZOAN

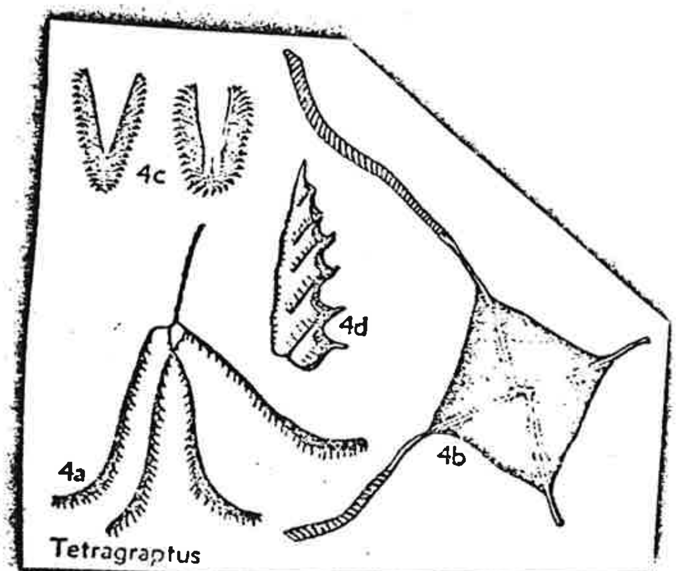


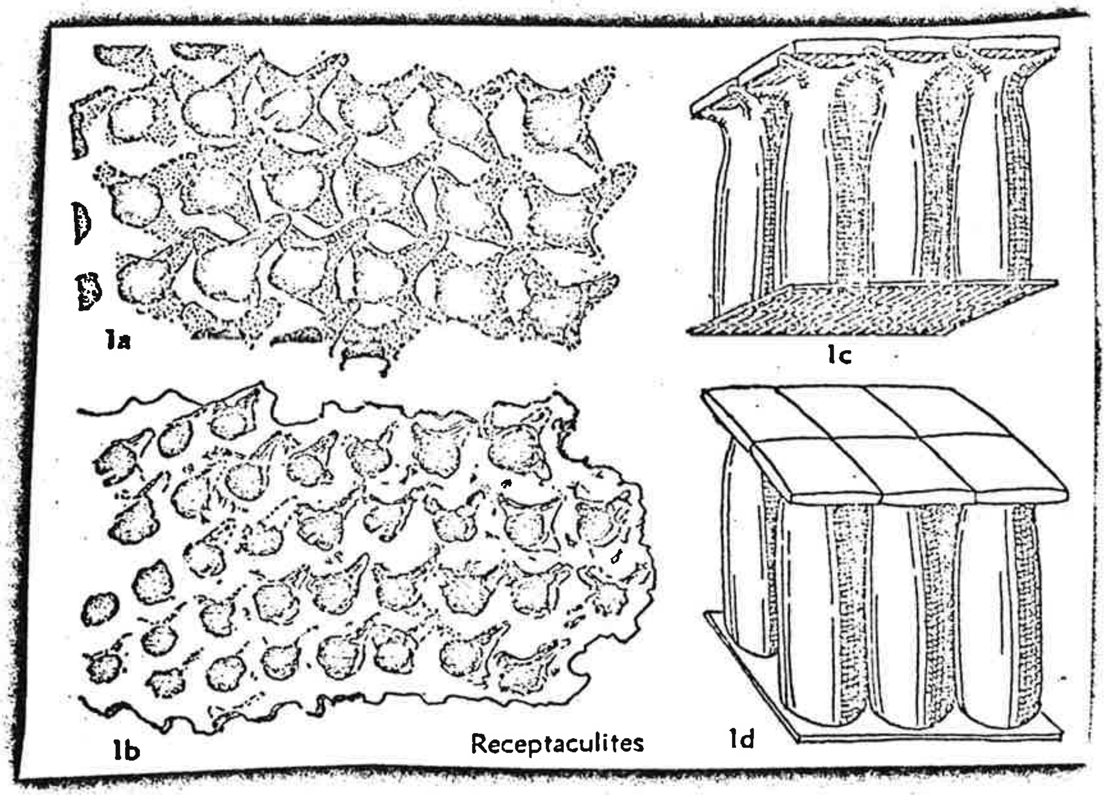
1

Fenestella

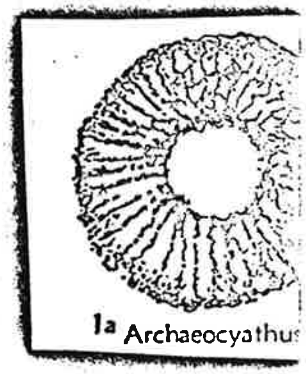
GRAPTOLITES






1a
1b
1c
1d
Receptaculites

SPONGE-LIKE FOSSILS



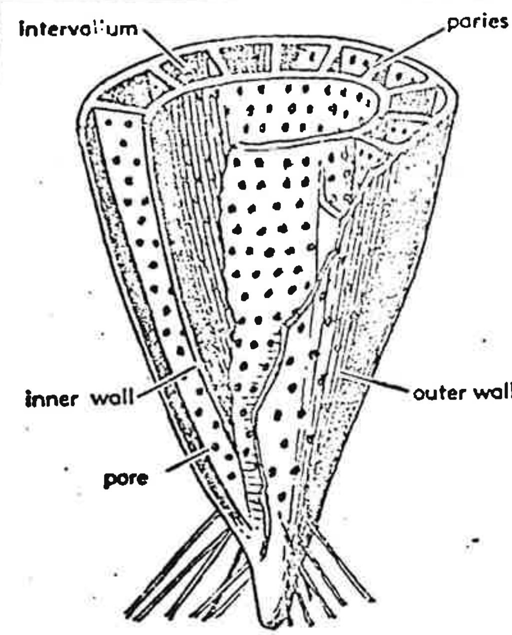
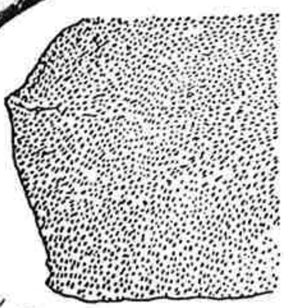
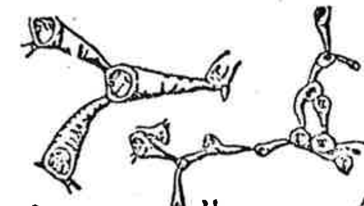


FIG. 3-10. Structural features of pleosponges. These fossils, confined to Lower and Middle Cambrian rocks, have a porous calcareous skeleton. Most of them have an inner and outer wall separated by a space (intervallum) which contains radial walls (parietes, sing. paries).

CORAL



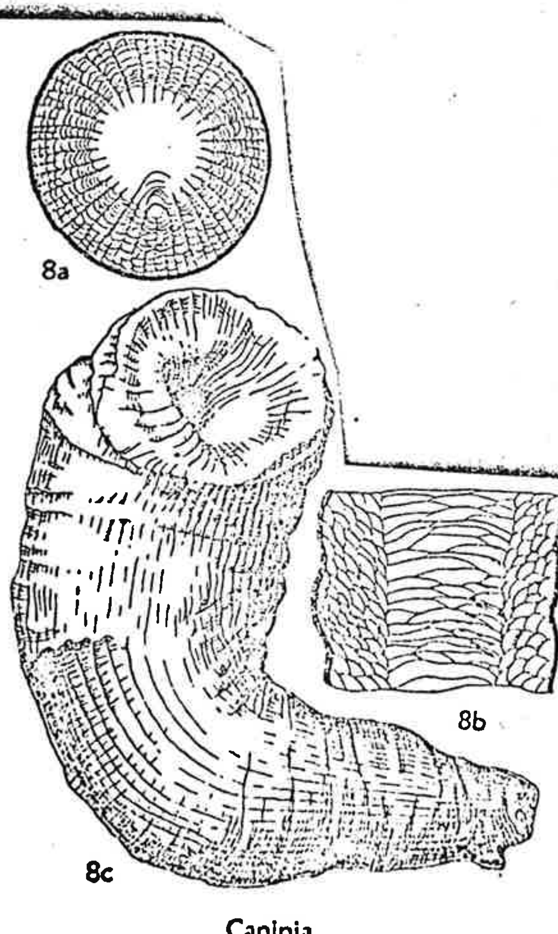
4 Alveolites



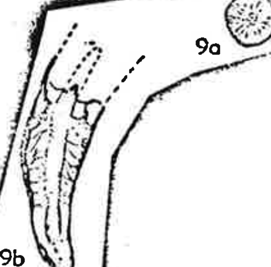
1a 1b Aulopora

2c Breviphrentis

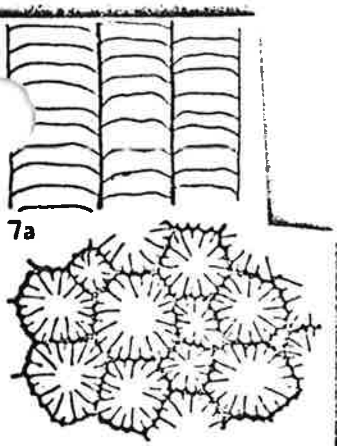
11a 11b Breviphyllum



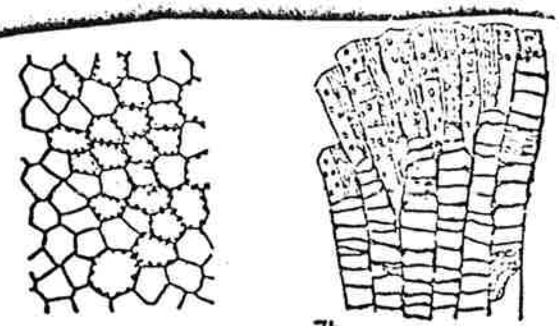
8a 8b 8c Caninia



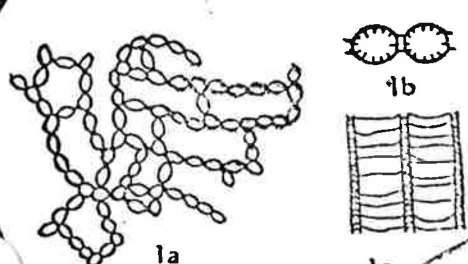
9a 9b Cyathaxonia



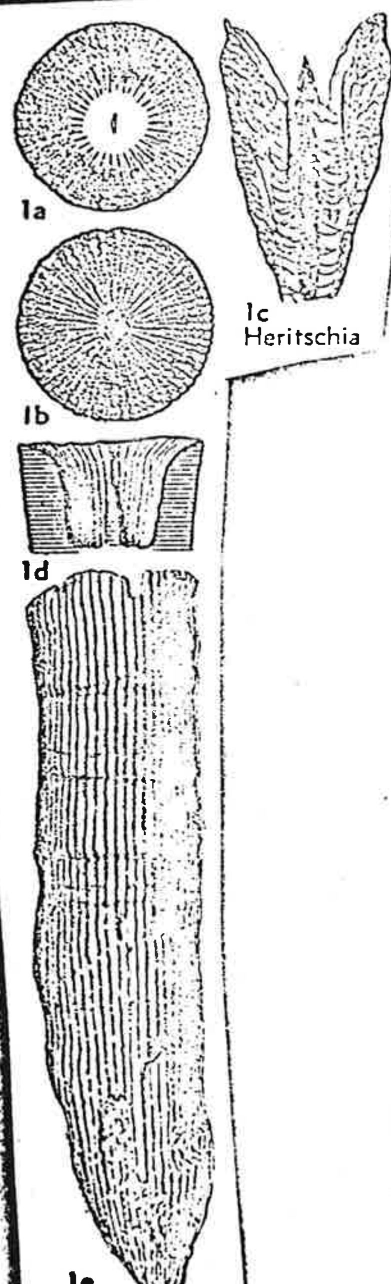
Favistella



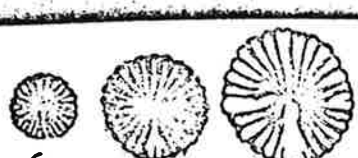
Favosites



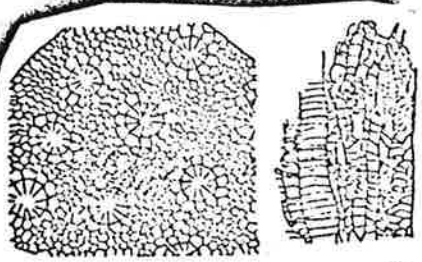
Halysites



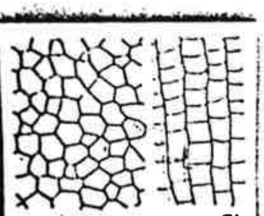
Heritschia



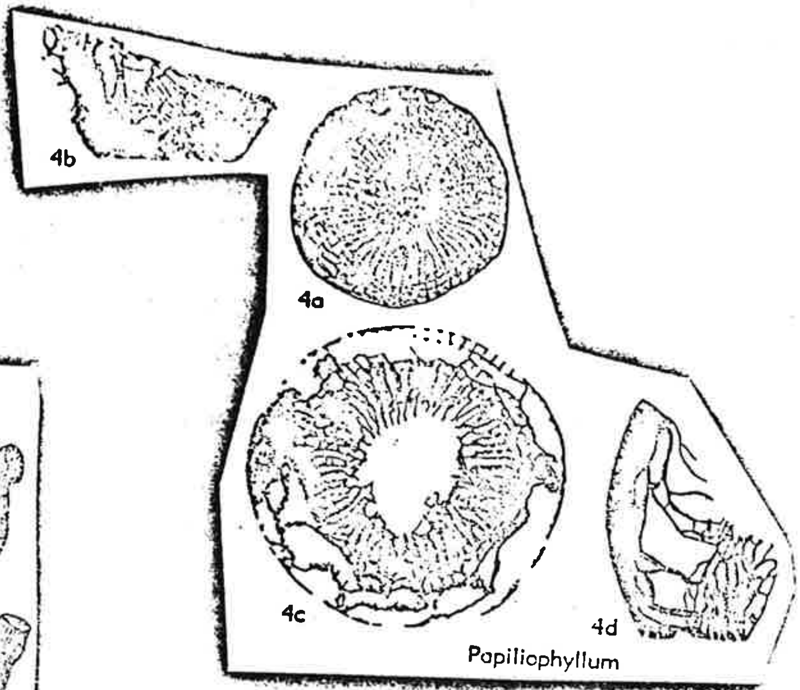
Hapsiphyllum



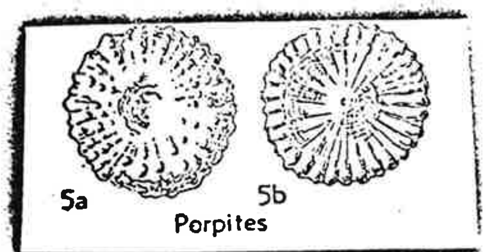
Heliolites

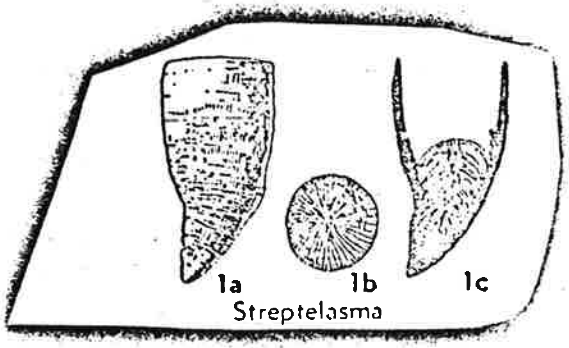


Lichenaria

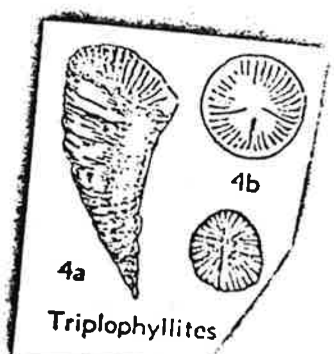

4b
4a
4c
4d
Papiliophyllum

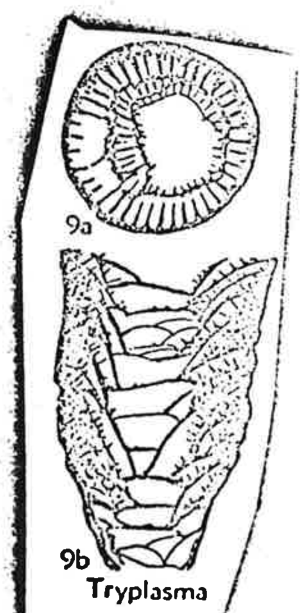

2b
2c
Palaeophyllum
2a


5a
5b
Porpites


1a
1b
1c
Streptelasma


8
Syringopora


4b
4a
Triplophyllites


9a
9b
Tryplasma

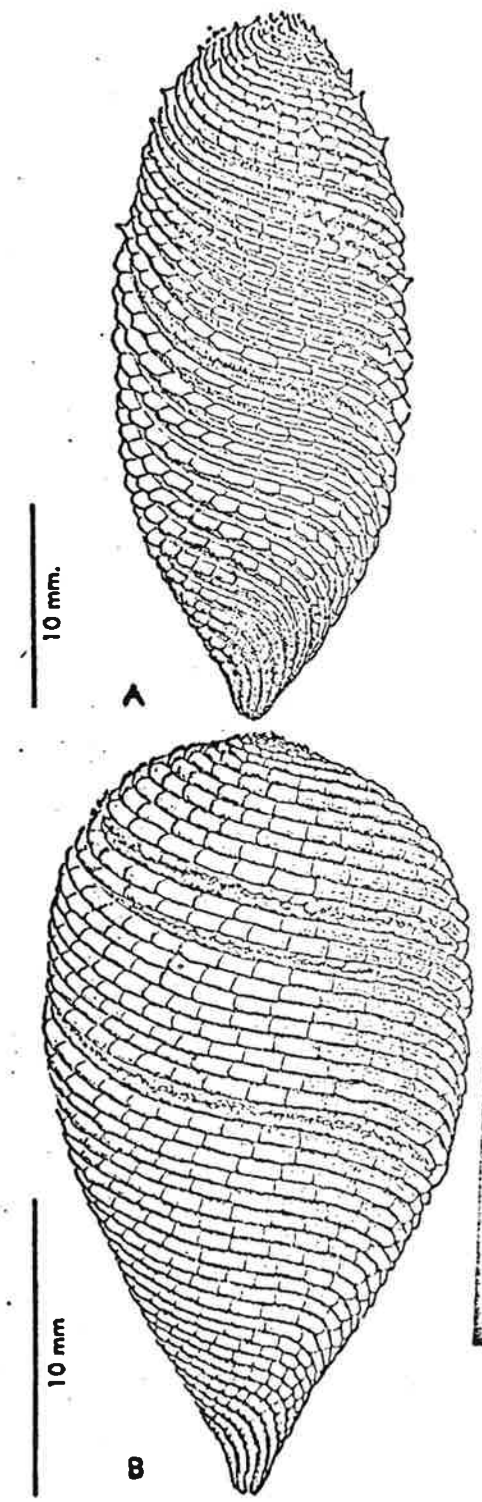
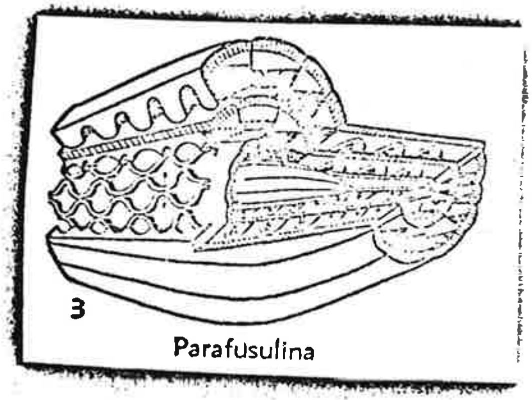


Fig. 109. Side views (reconstr.) of species of *Heli-coplacus*, both L.Cam. (*Olenellus* Zone), USA (Calif.), showing strong torsion of theca, oral ex-tremity at top, pointed aboral end directed down-ward.——*A*. *H. curtisi* Durham & Caster, partially expanded, a spinose species (1).——*B*. *H. gilberti* Durham & Caster, individual in retracted state (1



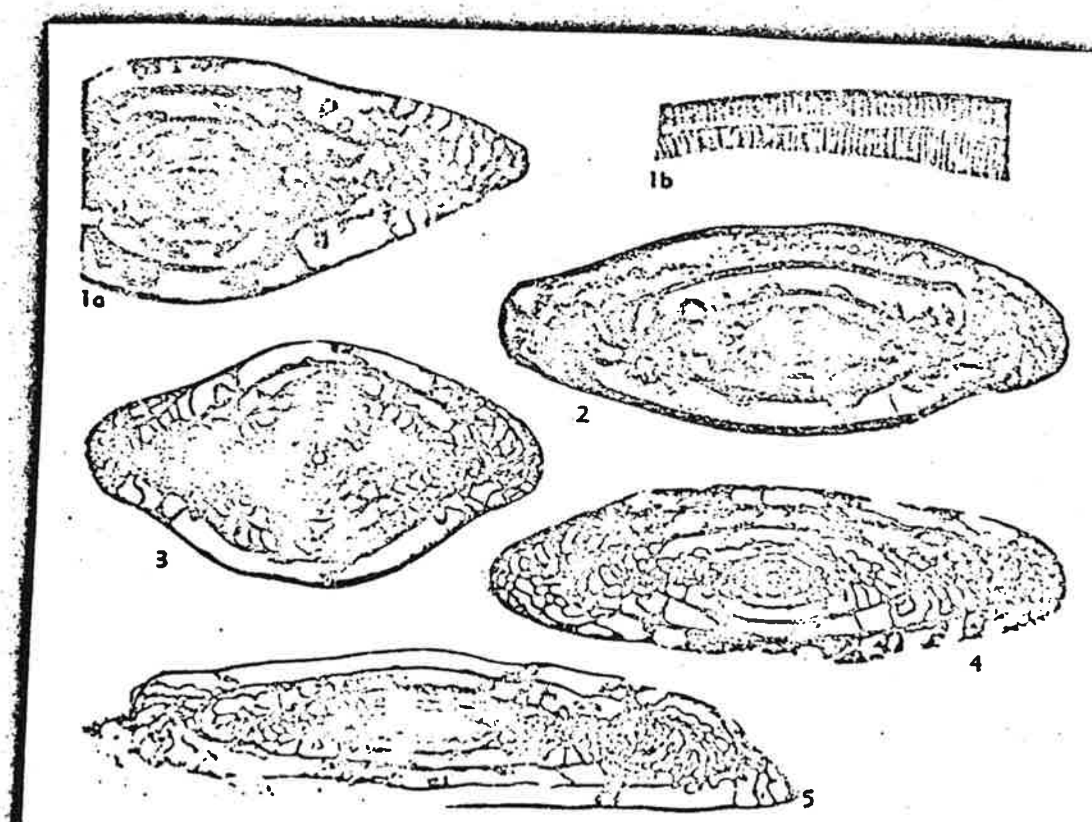


FIG. 322. Fusulinidae (Schwagerininae; *1-5, Triticites*) (p. C425-C426).

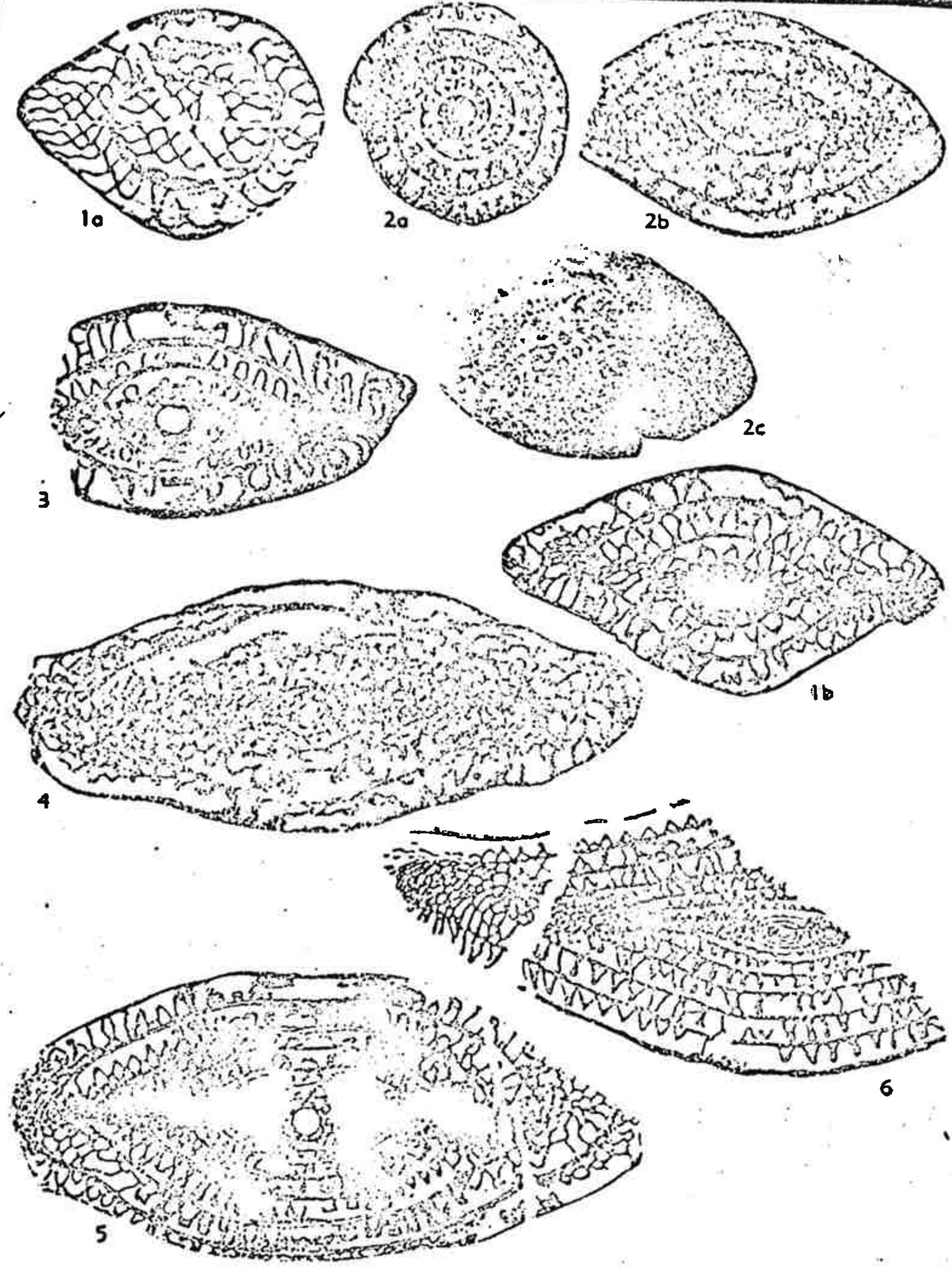
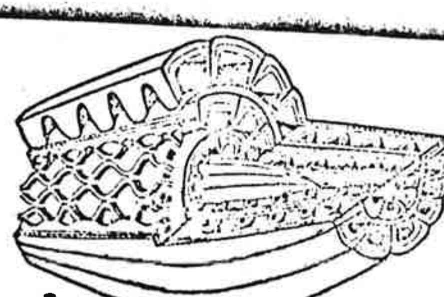


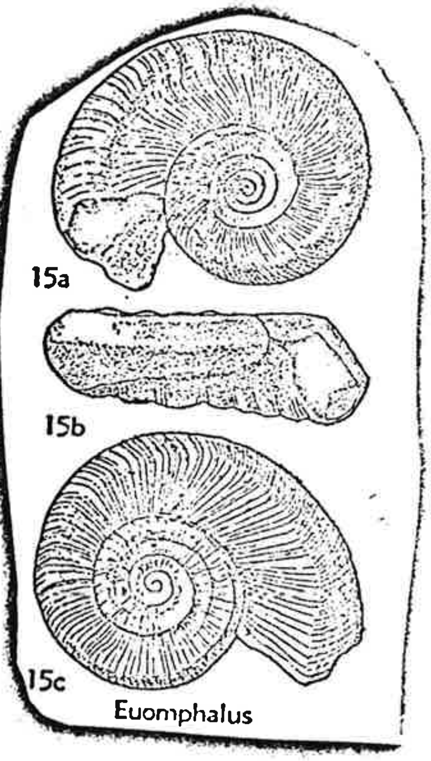
Fig. 314. Fusulinidae (Schwagerininae; *1-6, Schwagerina*) (p. C415-C416).

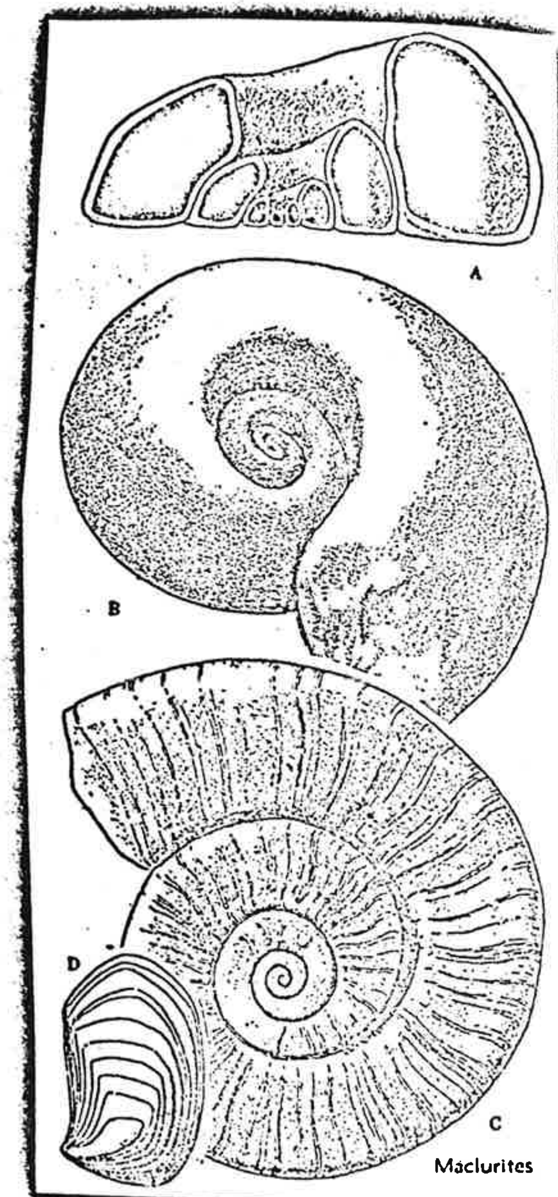
Triticites

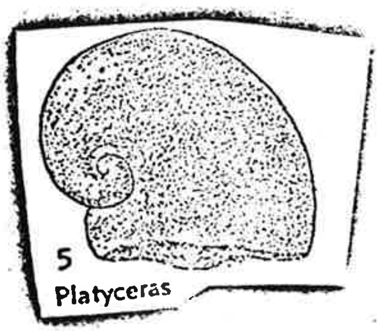


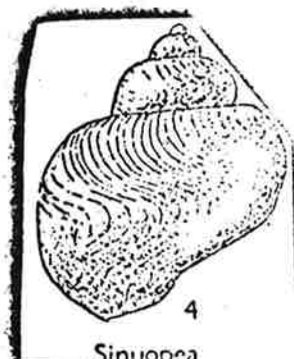
Triticites

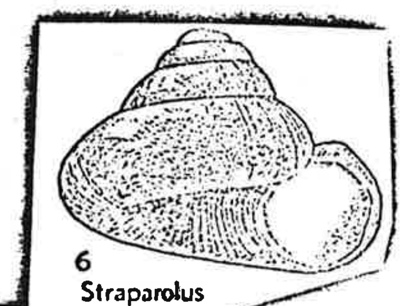
GASTROPODA

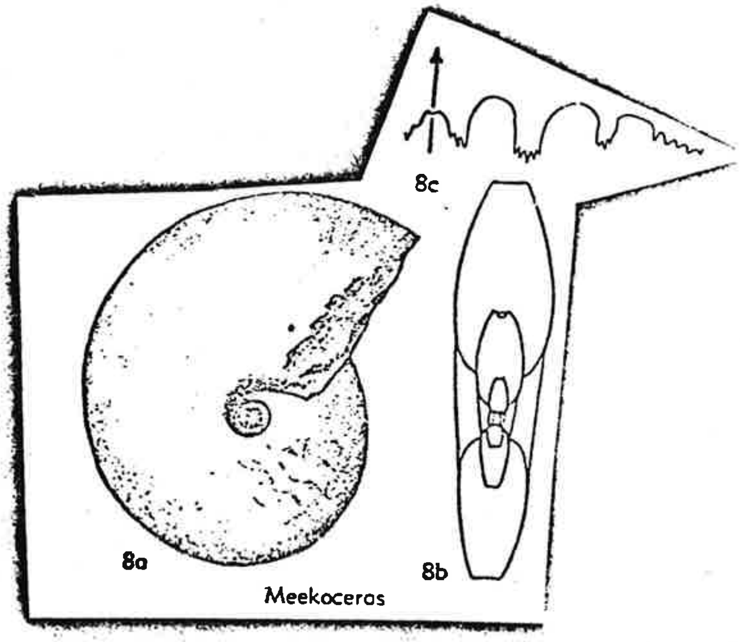

15a
15b
15c
Euomphalus

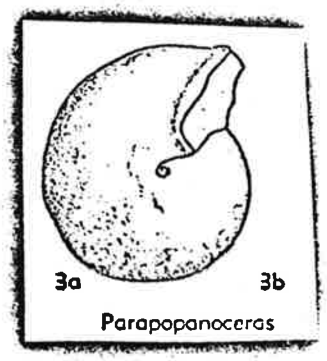

A
B
D
C
Maclurites

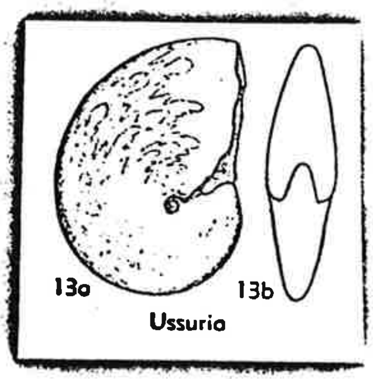

5
Platyceras


4
Sinuopea

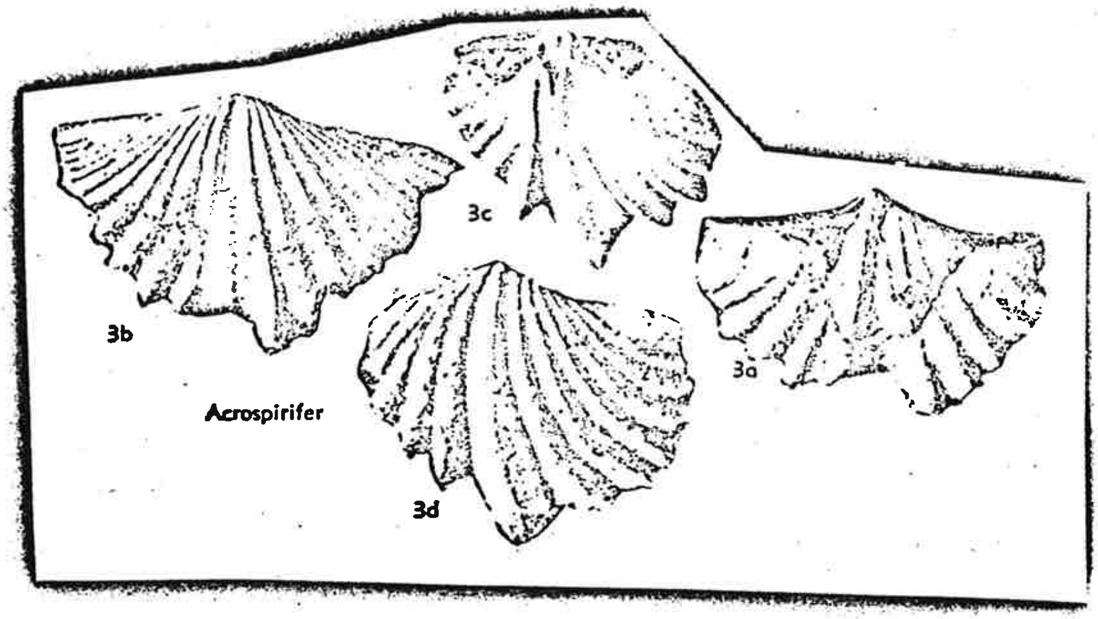

6
Straparolus

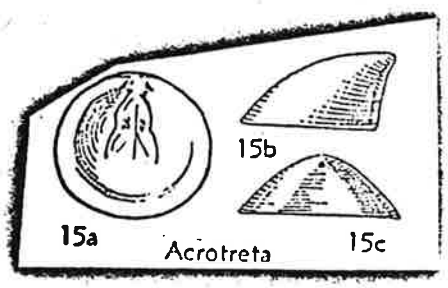

8c
8a
8b
Meekoceras

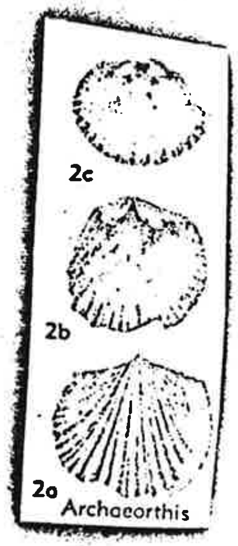

3a
3b
Parapopanoceras

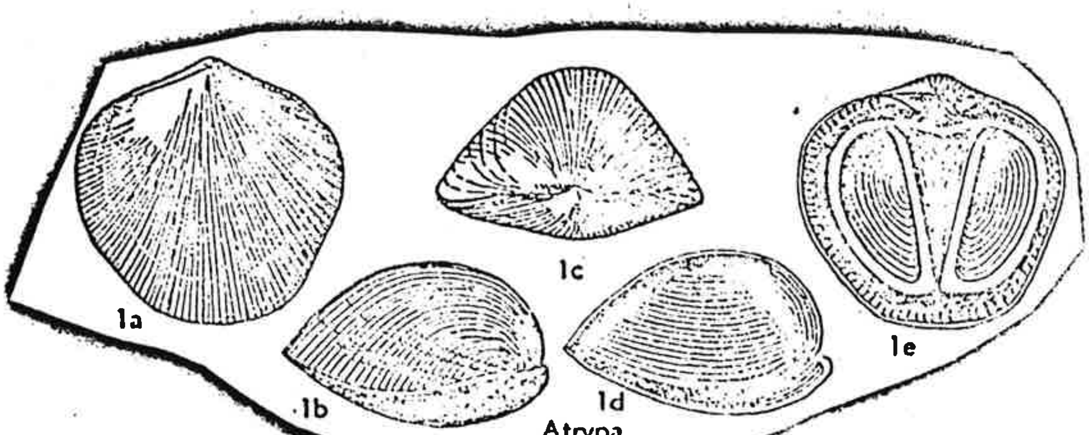

13a
13b
Ussuria

BRACHIOPODA

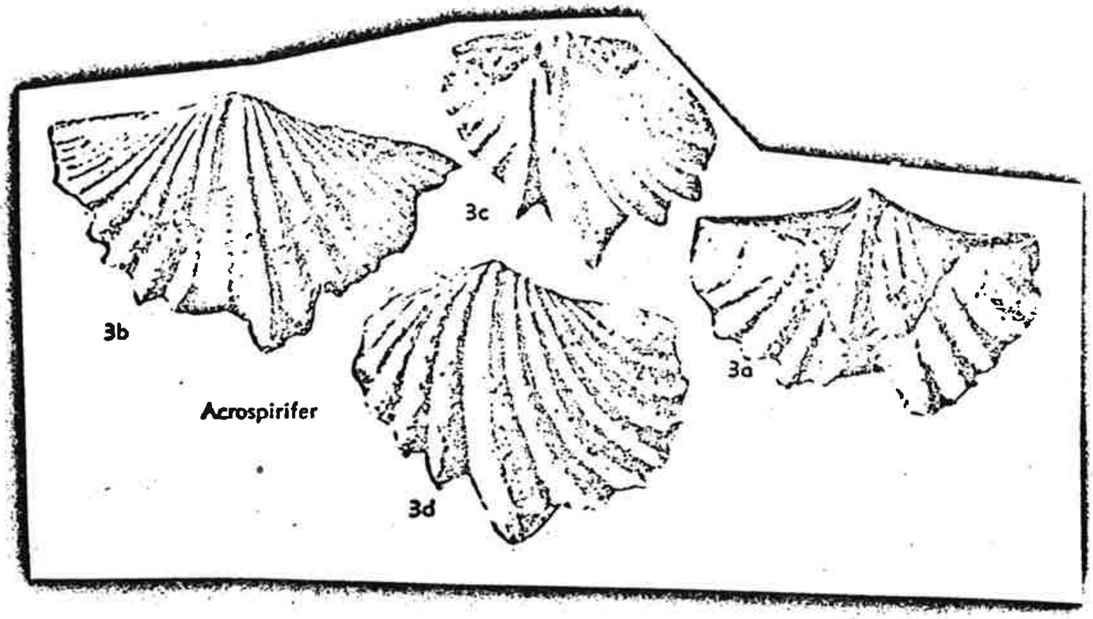


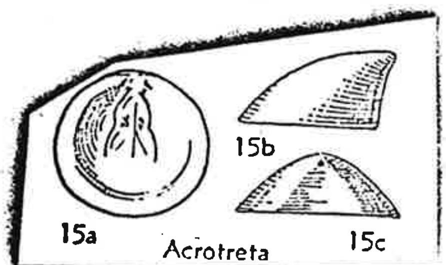


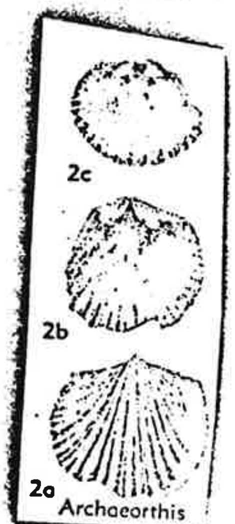


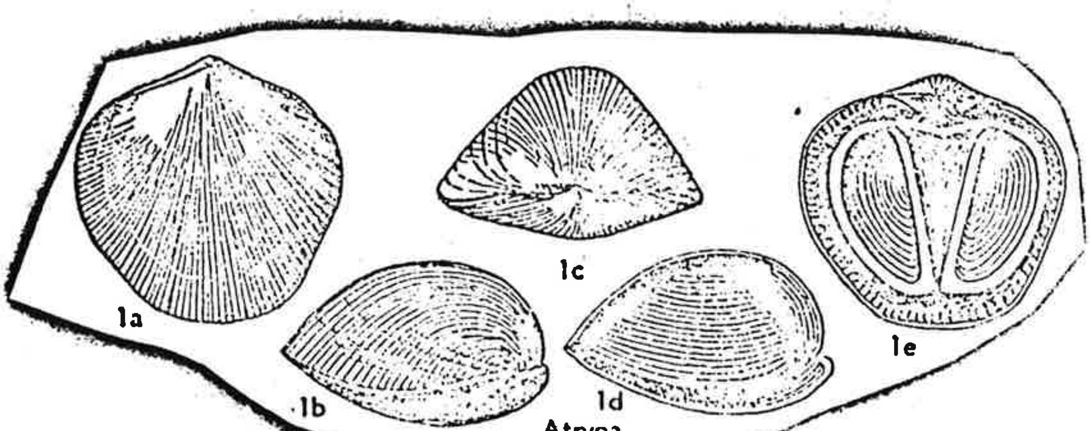


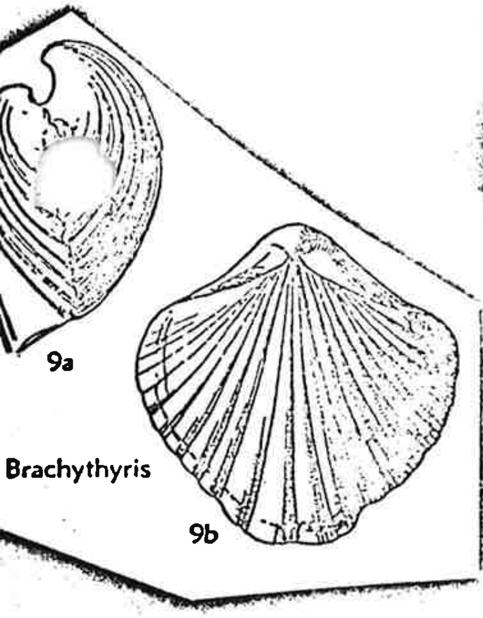
BRACHIOPODA

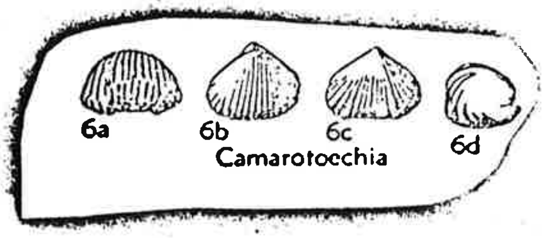




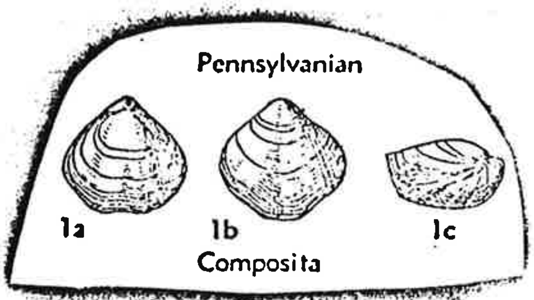




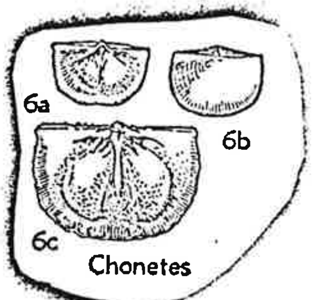

9a
Brachythyris
9b

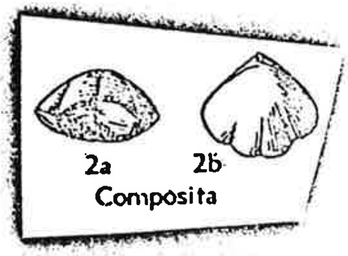

6a
6b
6c
6d
Camarotoechia

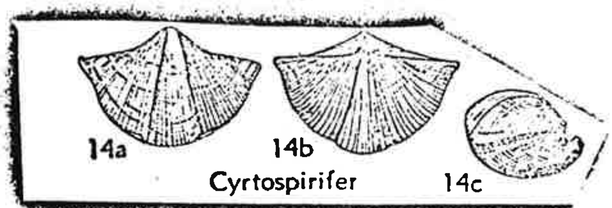

3
Cleiothyridina

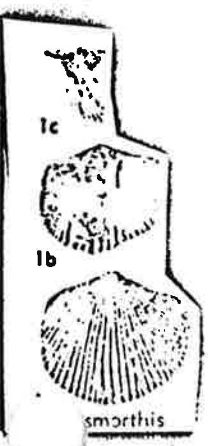

Pennsylvanian
1a
1b
1c
Composita

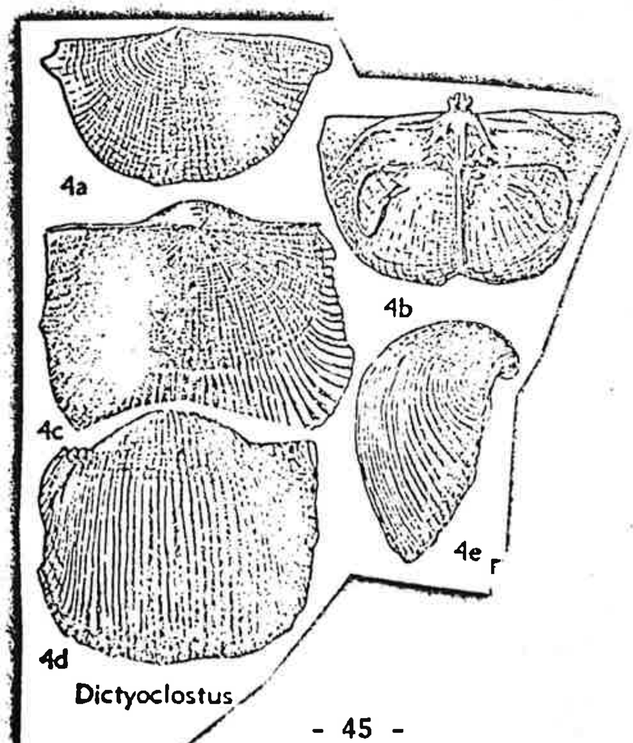

Chonetes

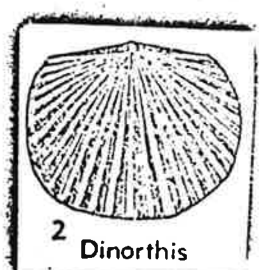

6a
6b
6c
Chonetes

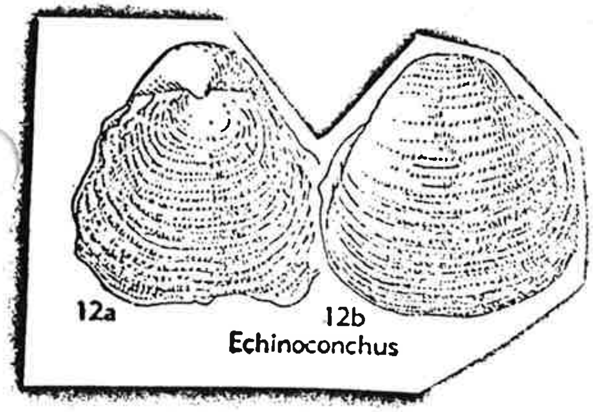

2a
2b
Composita


14a
14b
Cyrtospirifer
14c

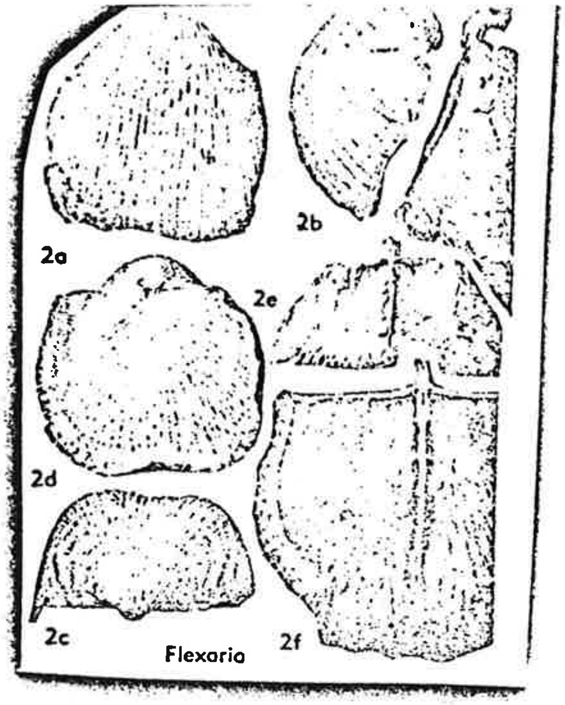

1c
1b


4a
4b
4c
4e
4d
Dictyoclostus

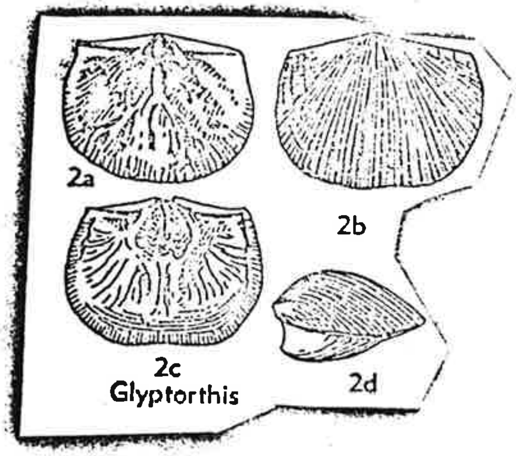

2
Dinorthis



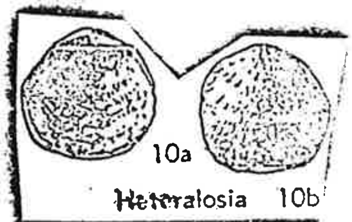
12a 12b
Echinoconchus



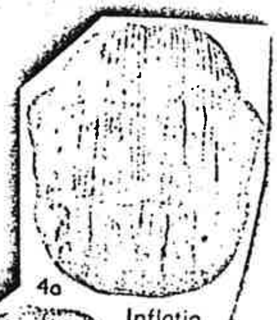
2a 2b 2e 2d 2c 2f
Flexaria

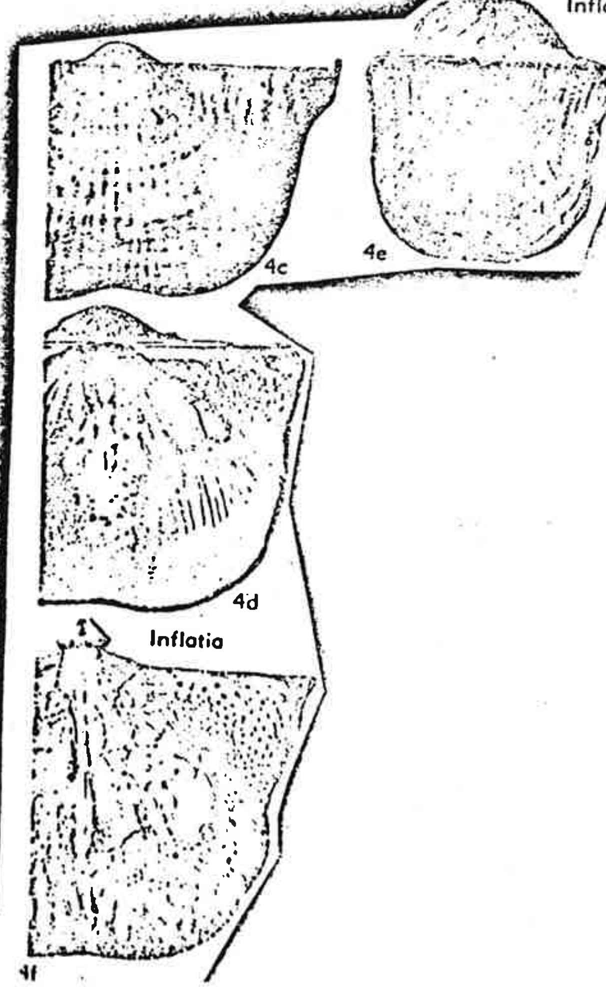


2a 2b 2c 2d
Glyptorthis



10a 10b
~~Heteralosia~~

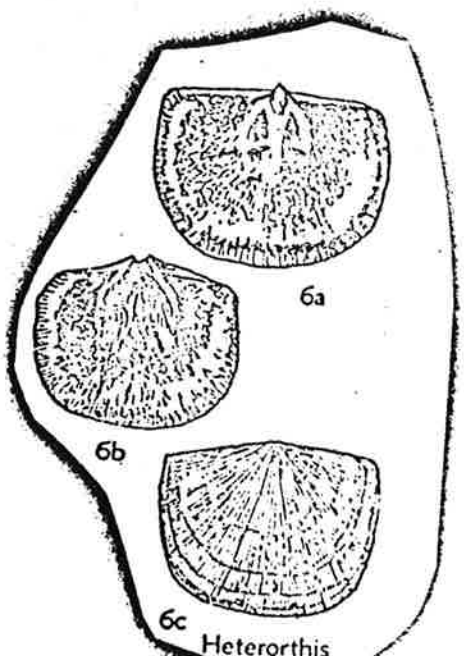




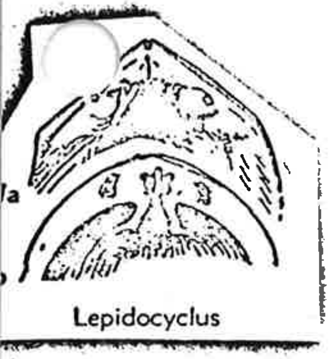
4a
Inflatia

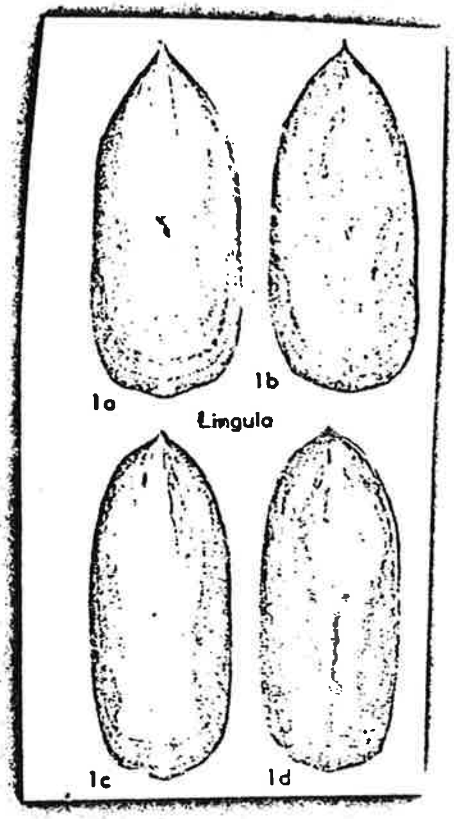
4c 4e 4d
Inflatia

4f

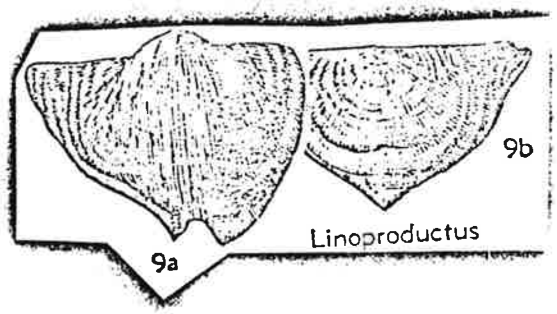


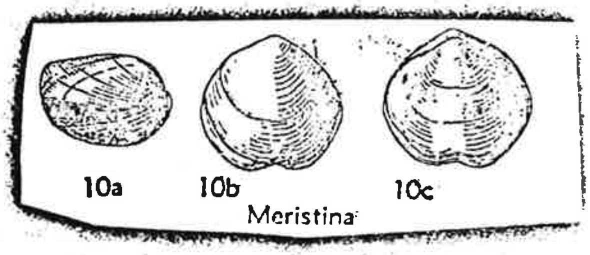
6a 6b 6c
Heterorthis

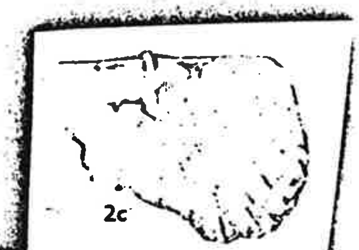

7a
Lepidocyclus

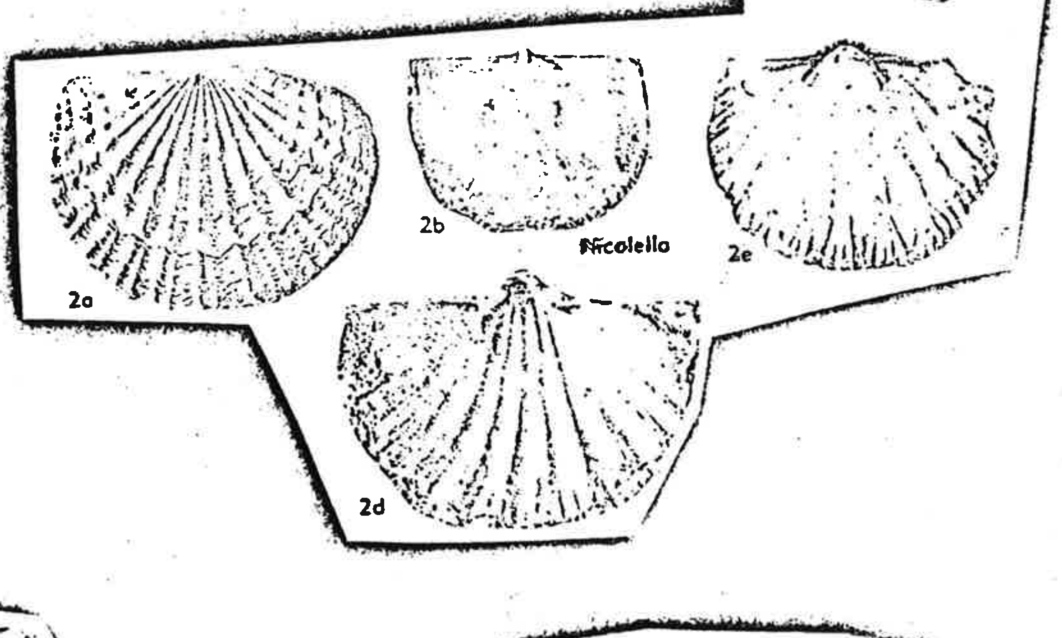

1a
1b
Lingula
1c
1d

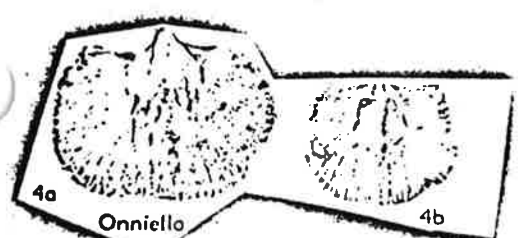

5a
5b
Linnarssonella

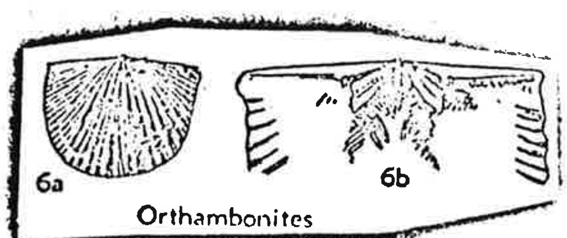

9b
Linoproductus
9a

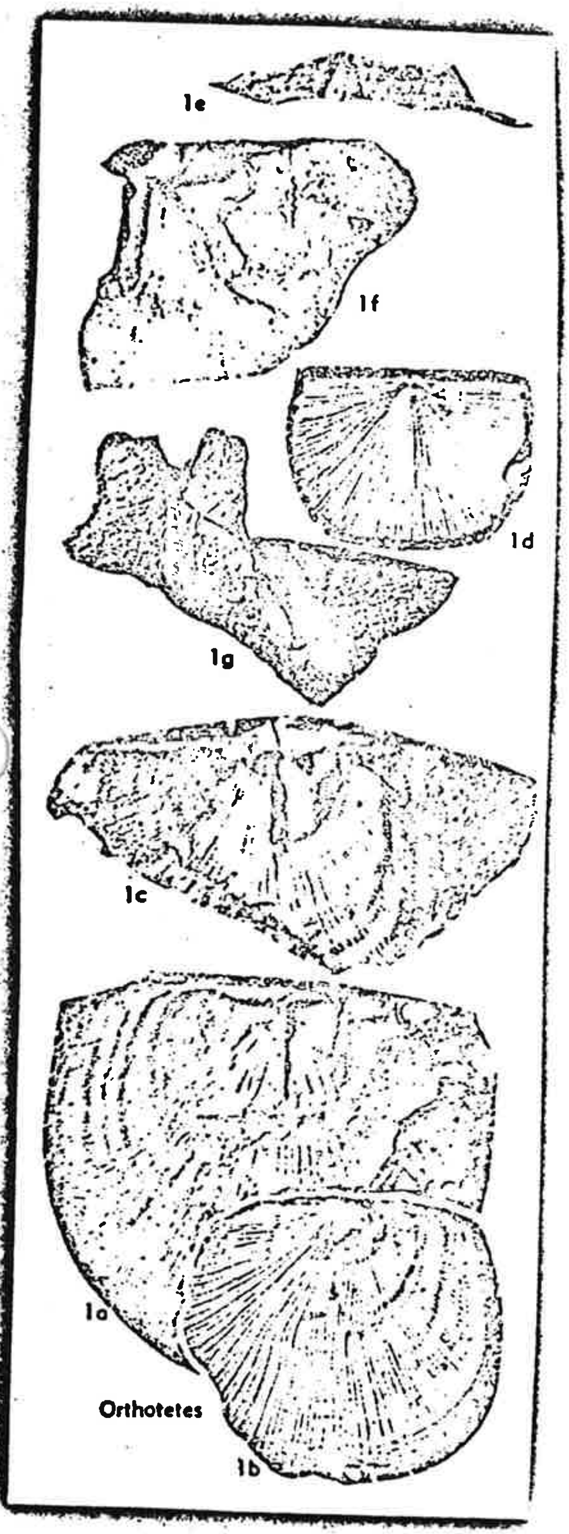

10a
10b
10c
Meristina

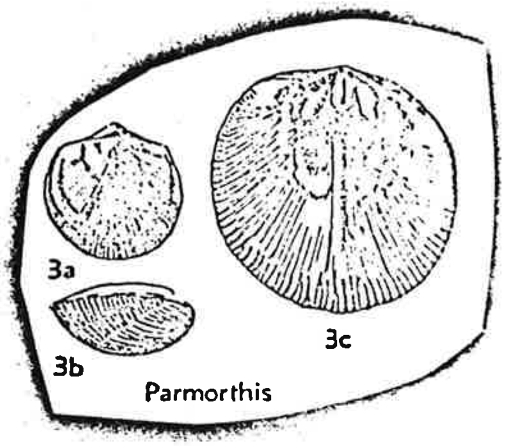

2c

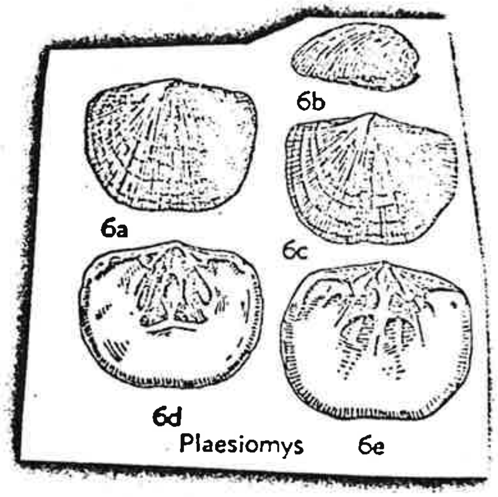

2b
Nicolella
2e
2a
2d

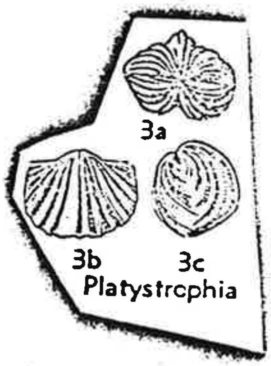

4a
Onniella
4b

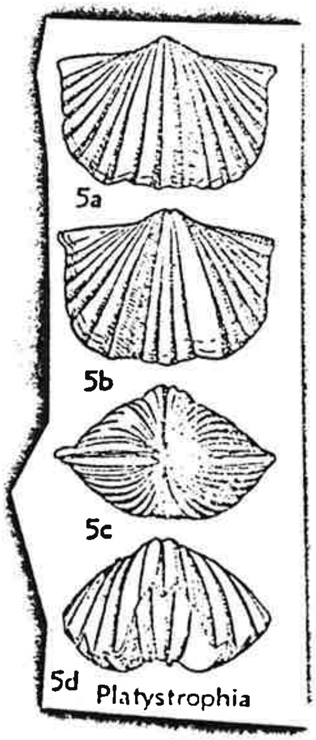

6a
6b
Orthambonites

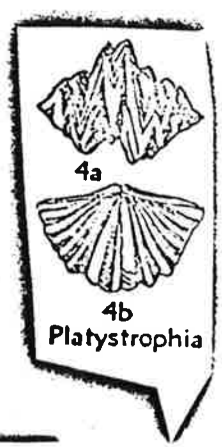

1e
1f
1d
1g
1c
1a
Orthotetes
1b

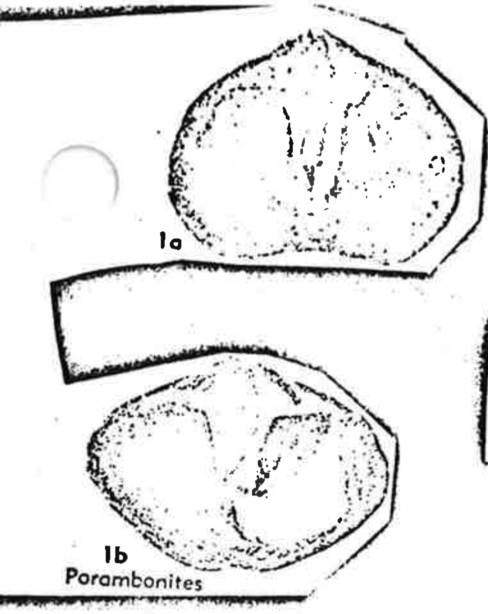

3a
3b
3c
Parmorthis

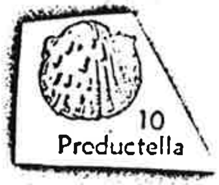

6b
6a
6c
6d
Plaesiomys
6e

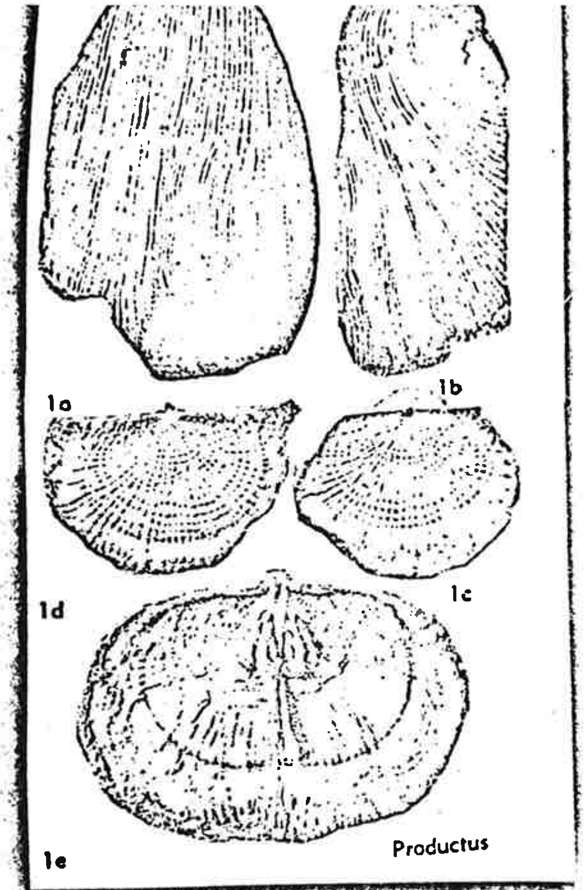

3a
3b
3c
Platystrophia

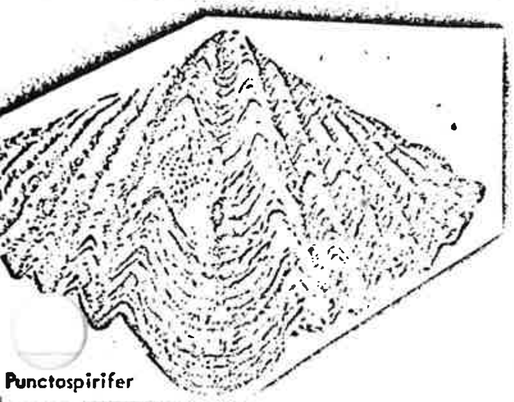

5a
5b
5c
5d
Platystrophia

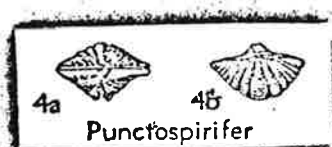

4a
4b
Platystrophia

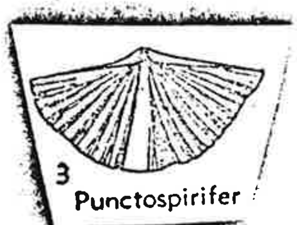

1a
1b
Porambonites


10
Productella


1a
1b
1d
1c
1e
Productus


Punctospirifer


4a
4b
Punctospirifer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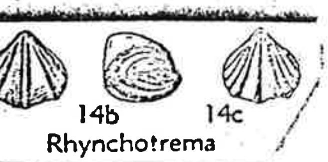
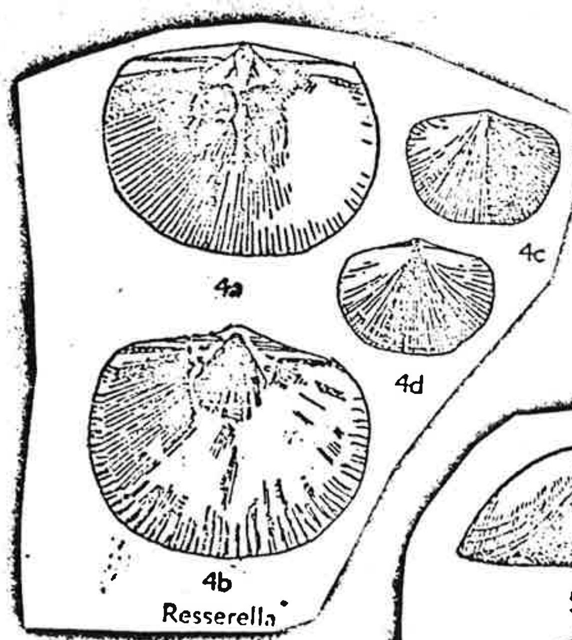
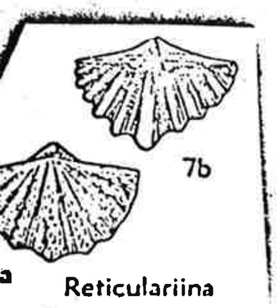
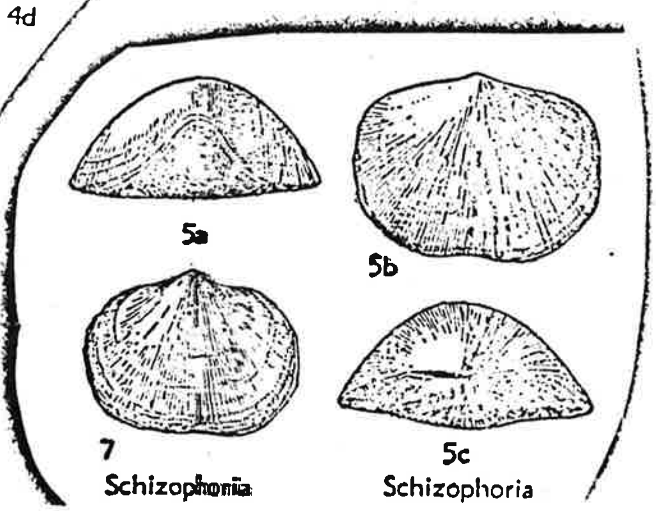
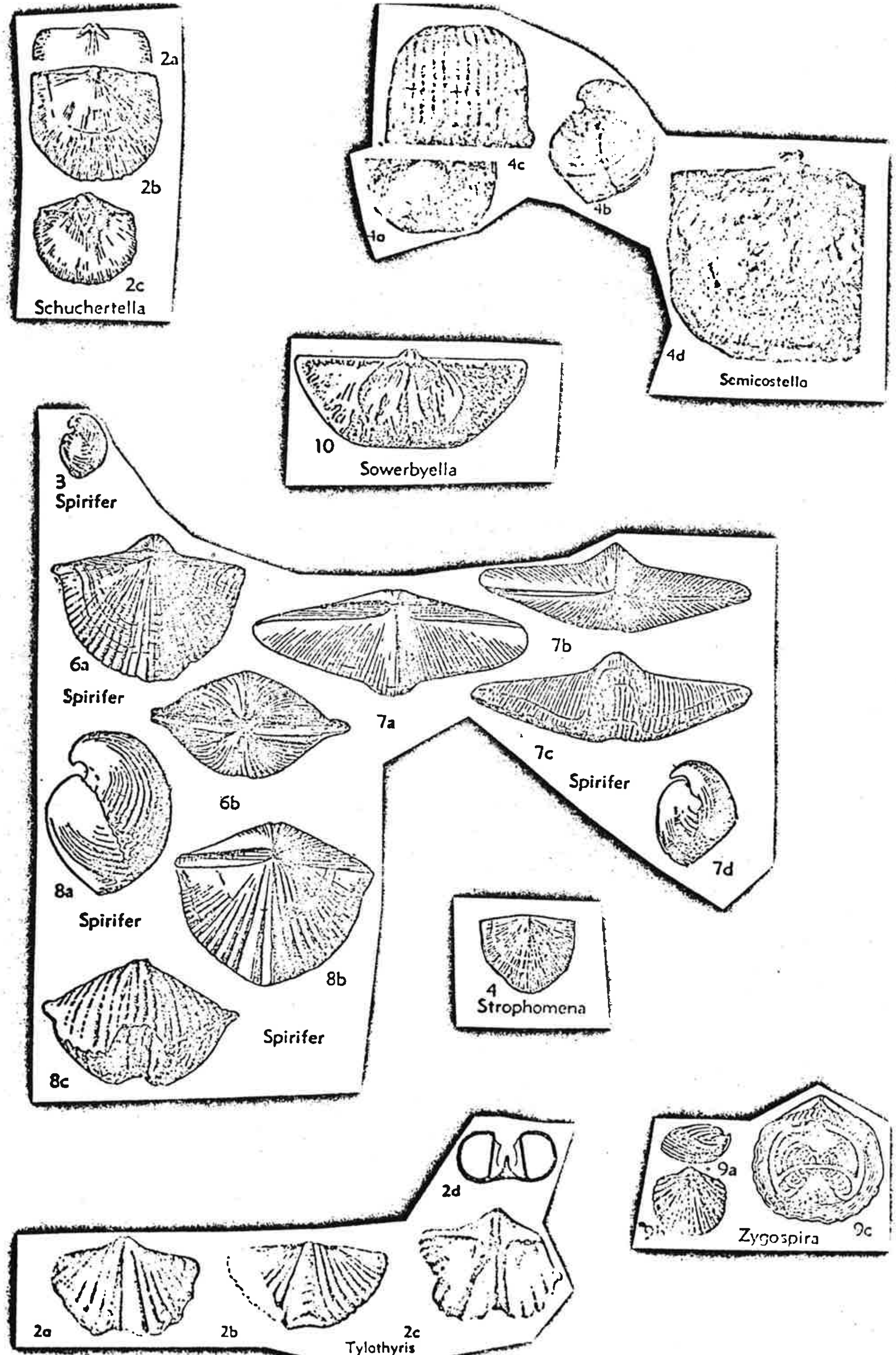
Punctospirifer


14b
14c
Rhynchotrema


4a
4c
4d
4b
Resserella


7b
Reticulariina

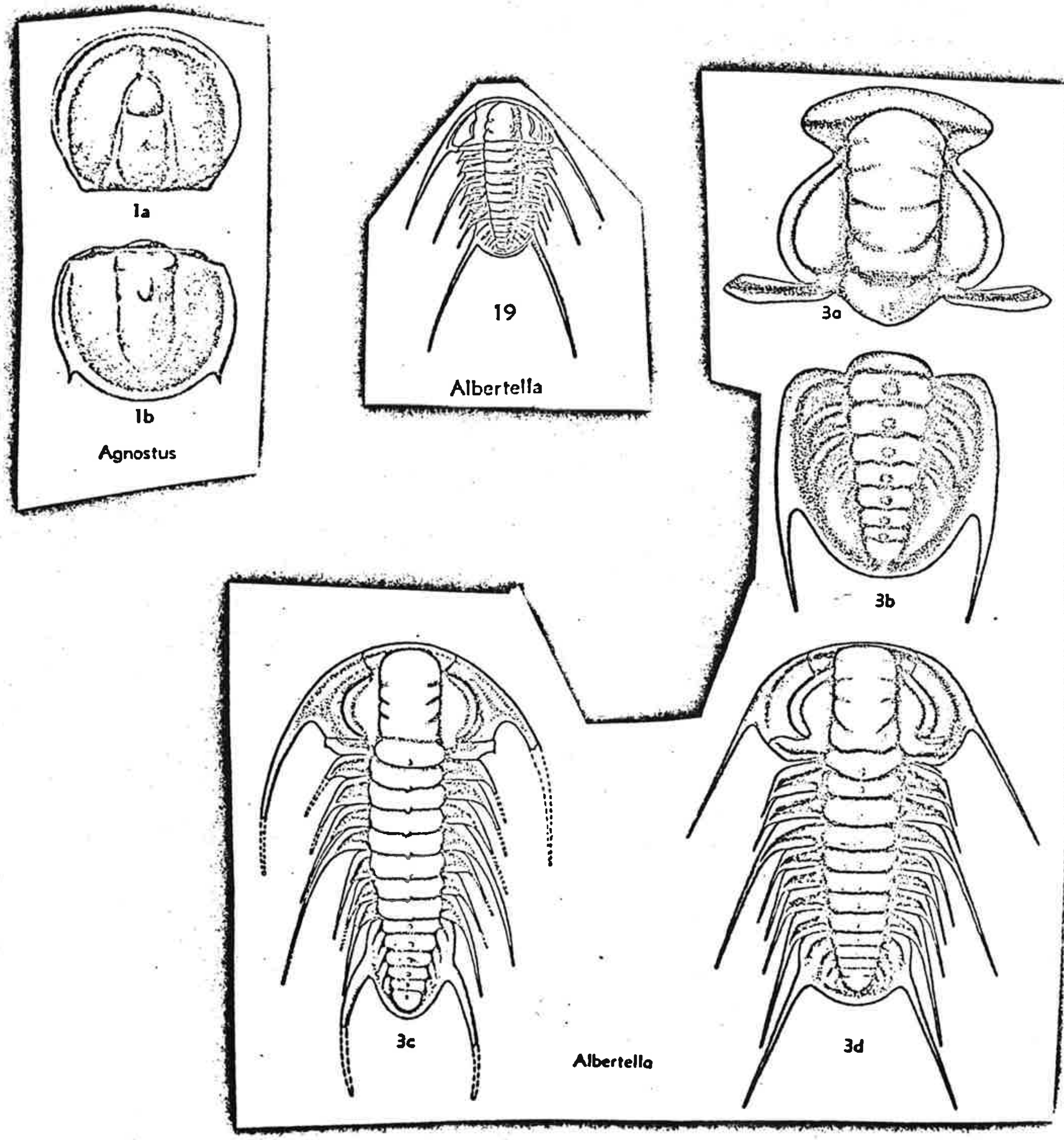

5a
5b
7
Schizophoria
5c
Schizophoria


2a
2b
2c
Schuchertella
4c
4b
4a
4d
Semicostella
10
Sowerbyella
3
Spirifer
6a
Spirifer
7a
7b
7c
Spirifer
7d
6b
8a
Spirifer
8b
4
Strophomena
8c
Spirifer
2d
2a
2b
2c
Tylothyris
9a
9b
9c
Zygospira

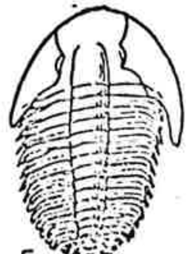
PELECYPODA

Delectopecten

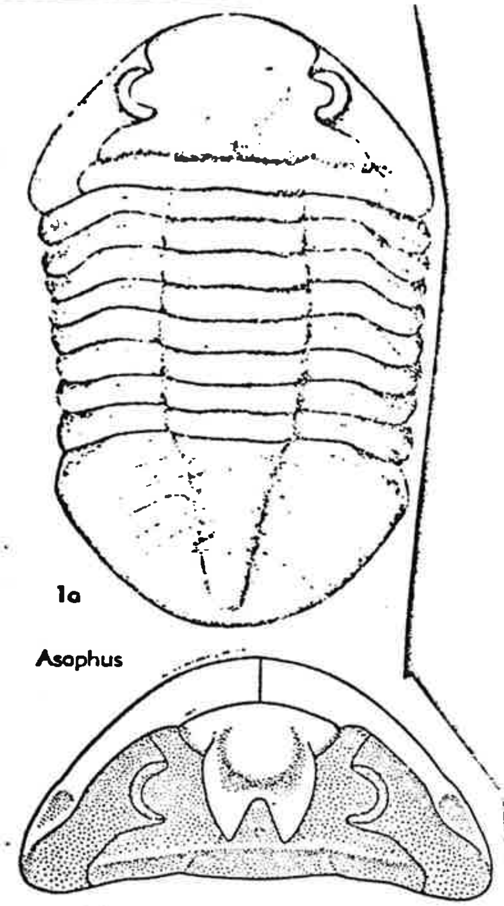
TRILOBITES



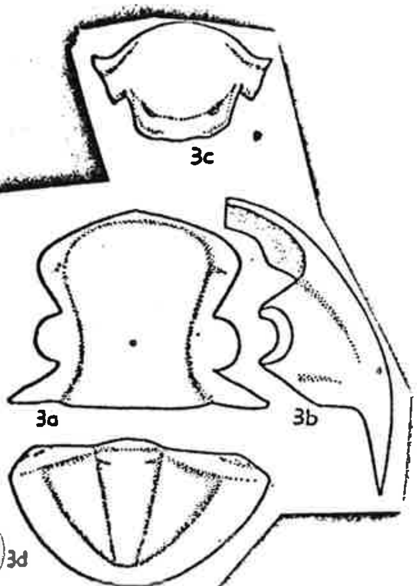
1
Alokistocare



5
Aphelaspis

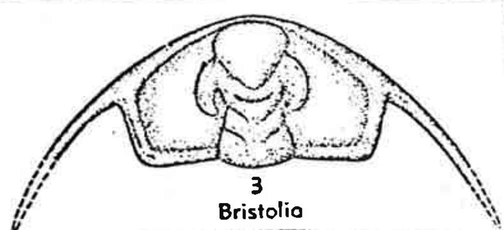


1a
Asaphus
1b

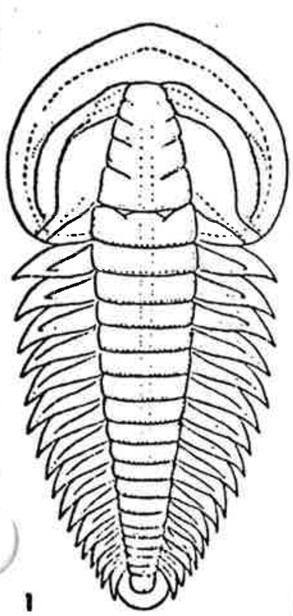


3c
3a
3b
3d
Bellefontia

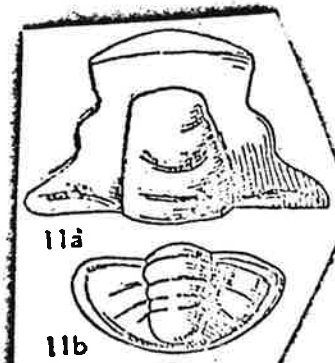
2a
2b
Bonnia



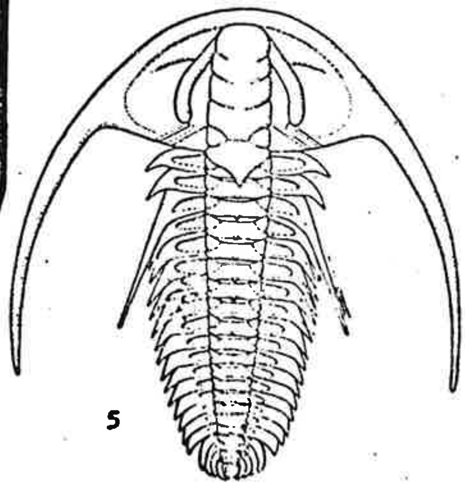
3
Bristolia



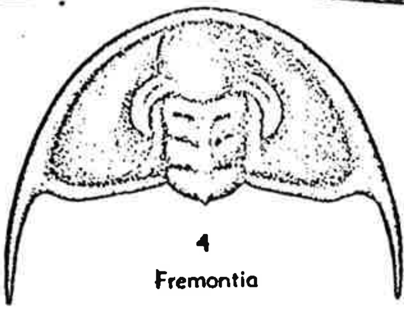
1
Daguinaspis



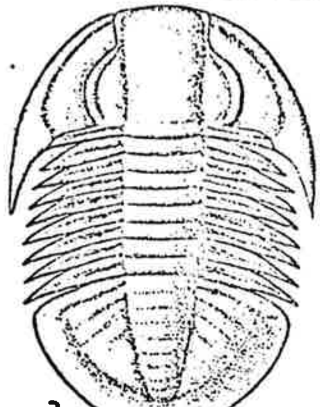
11a
11b
Elvinia



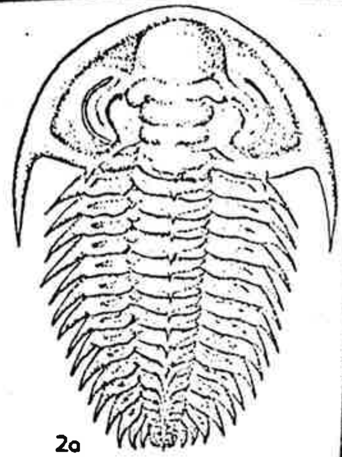
5
Fallotaspis



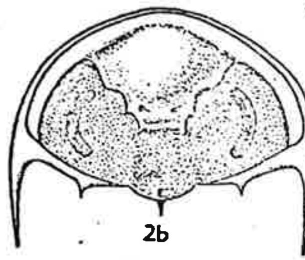
4
Fremontia



2
Glosspleura

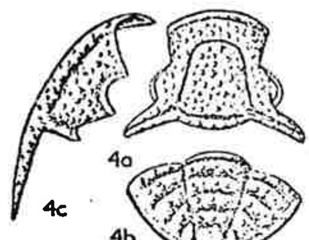


2a



2b
Holmia

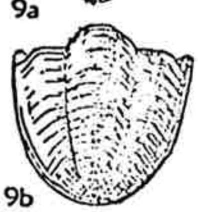
3
Homagnostus



Hystricurus

2
Judomia

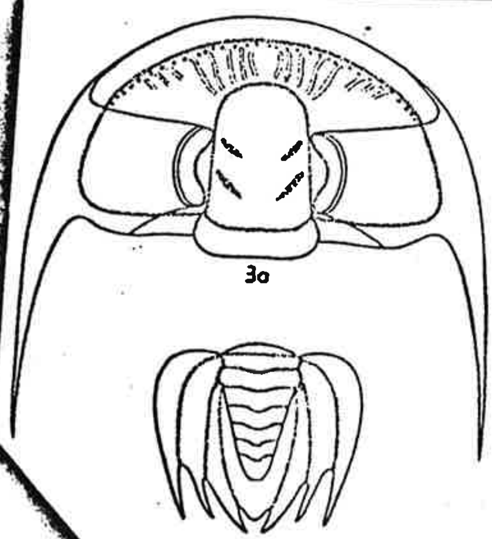
9a



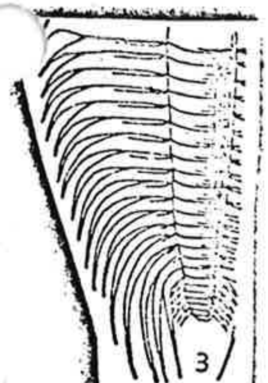
9b
Kaskia

14a

14b
Kochaspis

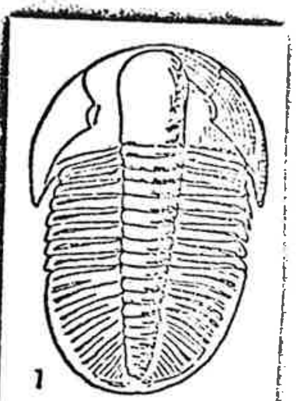


3b
Kainella



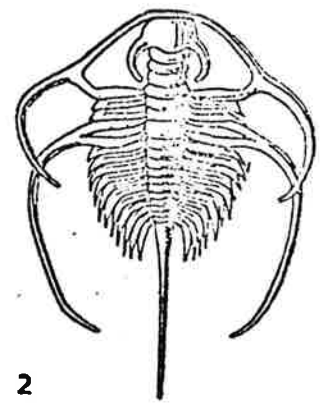
3

Nevadia



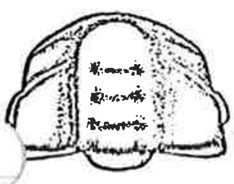
1

Ogygopsis



2

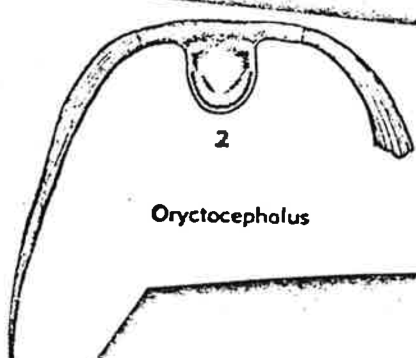
Olenellus



1a

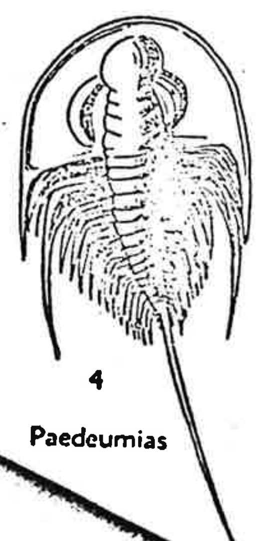
1b

Oryctocephalus



2

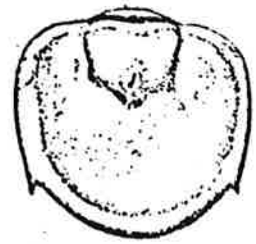
Oryctocephalus



4

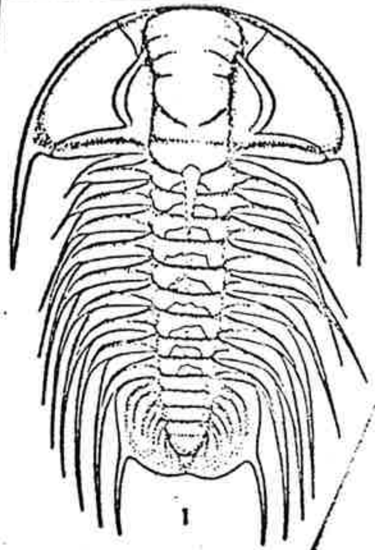
Paedeumias

2a



2b

Pseudagnostus



1

Stephenospis

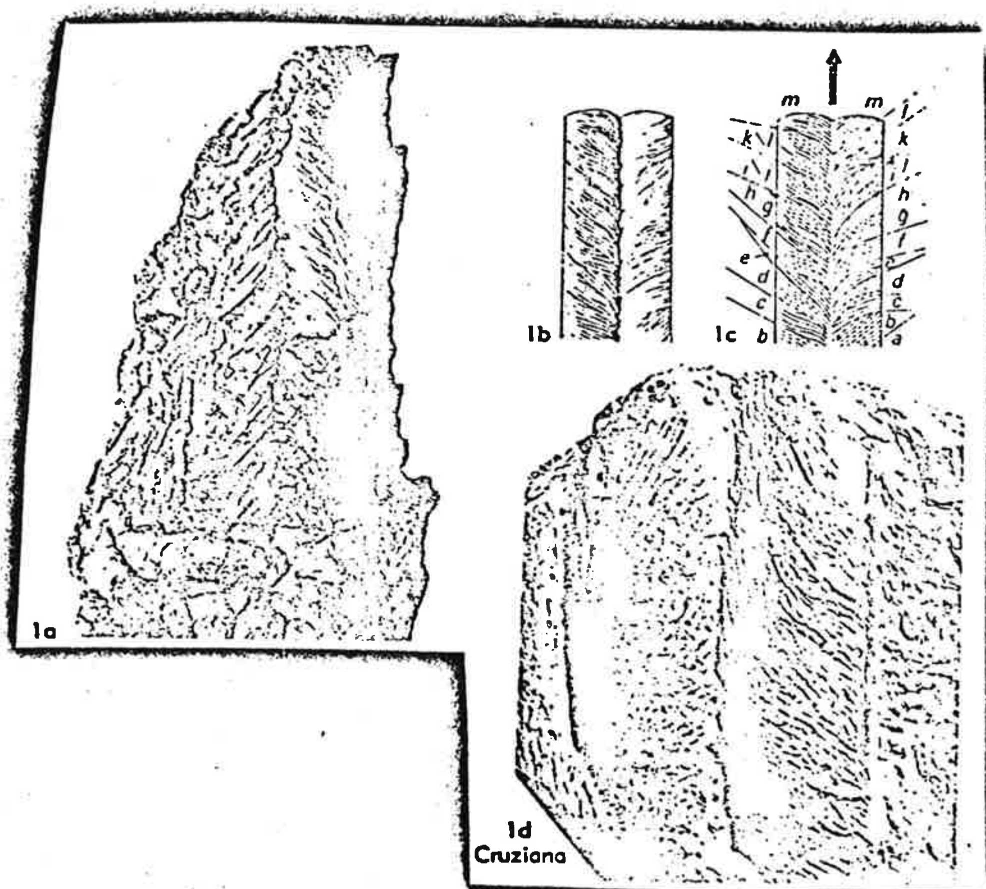
FIG. 183. *Shumardia pusilla* (SARS) (Shumardiidae), ?L.Ord.(Tremadoc.), Eng.; exoskel (reconstr.), ×22.5 (475).

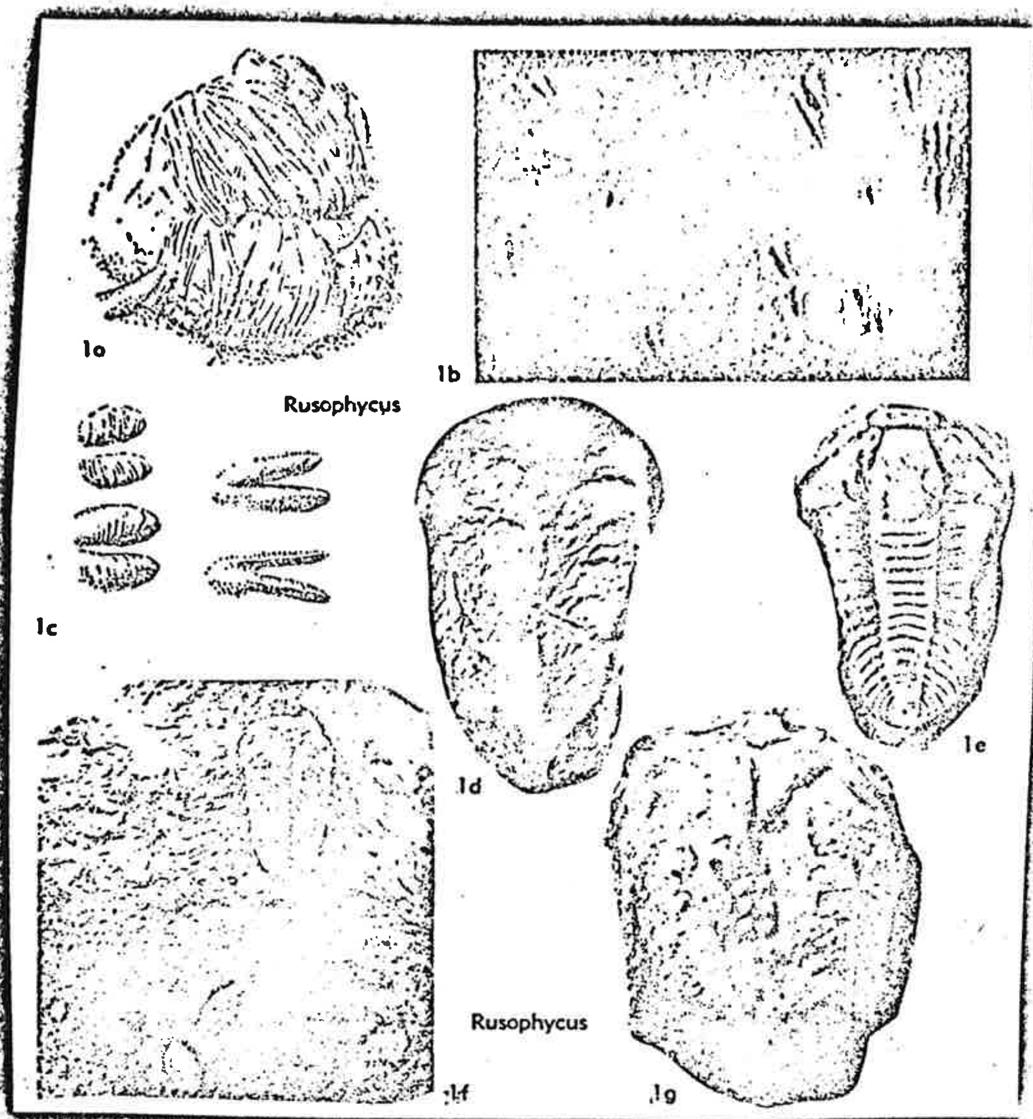
2
Wanneria

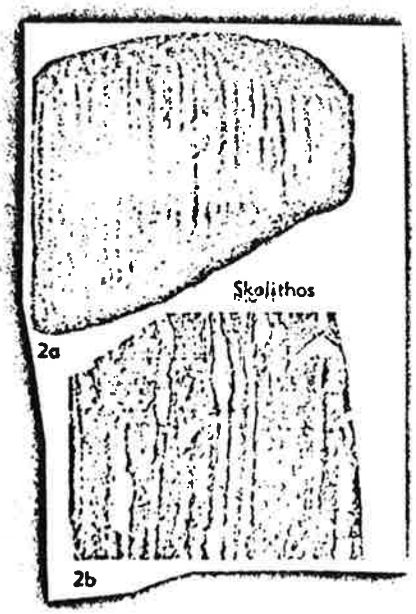
2

Zacanthopsis

TRACE FOSSILS




1a
1b
Rusophycus
1c
1d
1e
Rusophycus
1f
1g


Skolithos
2a
2b

APPENDIX IV

GEOREF PRINTOUT OF PUBLICATIONS ON GEOLOGY AND PALEONTOLOGY OF SALINE VALLEY AREA

AN - E74-07314
TI - BERGAUERIA PRANTL (CAMBRIAN AND ORDOVICIAN), A PROBABLE ACTINIAN TRACE FOSSIL
AU - ALPERT, STEPHEN P.
SO - J. PALEONTOL., VOL. 47, NO. 5, P. 919-924, ILLUS. (INCL. SKETCH MAP), 1973
TA - LOWER CAMBRIAN, NEW SPECIES B. RADIATA, RELATION TO CONOSTICHUS, CALIFORNIA, NEVADA
DE - UNITED STATES, ICHNOFOSSILS, CAMBRIAN, ORDOVICIAN, PALEONTOLOGY, TRACKS AND TRAILS, NORTH AMERICA, CALIFORNIA, WHITE-INYO MOUNTAINS, MARBLE MOUNTAINS, NEVADA, MORPHOLOGY, TAXONOMY, AFFINITIES, ACTINIAN, BERGAUERIA RADIATA, NEW TAXA, LOWER CAMBRIAN
LA - EL
JC - JPALA

AN - E75-26038
TI - Planolites and Skolithos from the upper Precambrian-lower Cambrian, White-Inyo Mountains, California
AU - Alpert, Stephen P.
SO - J. Paleontol., Vol. 49, No. , p. 508-521, plates, section, sketch map, 1975
DE - CALIFORNIA, PALEONTOLOGY, ICHNOFOSSILS, PRECAMBRIAN, CAMBRIAN, WYMAN FORMATION, SALINE VALLEY FORMATION, POLETA FORMATION, HARKLESS FORMATION, DEEP SPRING FORMATION, CAMPITO FORMATION, WHITE MOUNTAINS, INYO MOUNTAINS, OCCURRENCE, BURROWS, TRACKS AND TRAILS, TAXONOMY, PLANOLITES, SKOLITHOS, NEW TAXA, UNITED STATES, BIOSTRATIGRAPHY, UPPER PRECAMBRIAN, LOWER CAMBRIAN
LA - EL
JC - JPALA

AN - T75-26117
TI - Trace fossils of the Precambrian-Cambrian succession, White-Inyo mountains, California
AU - Alpert, Stephen Paul
SO - Doctoral, 1974, UCLA, Diss. Abstr. Int., Vol. 35, No. 8, p. 4072B, 1975
DE - CALIFORNIA, STRATIGRAPHY, PRECAMBRIAN, LOWER CAMBRIAN, BIOSTRATIGRAPHY, EAST, INYO COUNTY, MONO COUNTY, WHITE MOUNTAINS, INYO MOUNTAINS, WESTGARD PASS, ANDREWS MOUNTAIN, UNITED STATES, ICHNOFOSSILS, BOUNDARY, UPPER PRECAMBRIAN, DEEP SPRING FORMATION
LA - EL

AN - E76-23994
TI - Borate exploration and mining in the Death Valley region
AU - Barker, J. M.
SO - Min. Eng., Vol. 27, No. 12, p. 68d, 1975
CC - 28
DE - BORON, UNITED STATES, CALIFORNIA, DEATH VALLEY, ORE DEPOSITS, BORATES, RESOURCES, OCCURRENCE, AREAL GEOLOGY, PRODUCTION, HISTORY, ECONOMIC GEOLOGY
LA - EL
JC - MIENA

AN - E76-43840
TI - Utilization of Skylab S192 satellite imagery for geological investigations
AU - Bechtold, I. C.; Wagner, G.; Reynolds, J. T.
SO - Geol. Soc. Am., Abstr. Programs, Vol. 7, No. 7, p. 993-994, 1975
CC - 20
DE - GEOPHYSICAL SURVEYS, INFRARED SURVEYS, UNITED STATES, CALIFORNIA, ARIZONA, APPLICATIONS, STRUCTURAL ANALYSIS, GEOMORPHOLOGY, SOILS, TECTONOPHYSICS, SKYLAB, REMOTE SENSING, DEATH VALLEY, FLUVIAL FEATURES, DRAINAGE PATTERNS, METHODS, COMPOSITION, FAULTS, SYSTEMS, INTERPRETATION, HEAT FLOW, REGIONAL PATTERNS, MEASUREMENT
LA - EL
JC - GAAPB

AN - D74-33798
TI - SALINE VALLEY AREA, INYO COUNTY
AU - CALIFORNIA STATE DIVISION OF MINES.
SO - CALIF. DIV. MINES GEOL., MINER. INFORM. SERV., VOL. 8, NO. 8, P. 1-8, ILLUS. (INCL. SKETCH MAP), 1955
TA - WITH OBITUARIES OF F. C. VAN DEINSE AND GEORGE W. HALLOCK
DE - CALIFORNIA, MINERAL RESOURCES, ECONOMIC GEOLOGY, UNITED STATES, SALINE VALLEY, INYO COUNTY, ORE DEPOSITS
LA - EL
JC - CDMIA

AN - M76-37533
TI - Stratigraphy and depositional environments of lower part of Nopah Formation (upper Cambrian), southern Great Basin
AU - Cooper, J. D.; Miller, R. H.
SY - in AAPG-SEPM annual meeting
SO - Am. Assoc. Pet. Geol., Bull., Vol. 60, No. 4, p. 659, 1976
TA - Invertebrates, conodonts, stratigraphic marker
CC - 12
DE - CALIFORNIA, STRATIGRAPHY, CAMBRIAN, NOPAH FORMATION, GREAT BASIN, INYO COUNTY, DEATH VALLEY, NEVADA, NYE COUNTY, CLARK COUNTY, UNITED STATES, PALEOENVIRONMENT, MARKER BEDS, SEDIMENTARY ROCKS, CLASTICS, TERRIGENOUS, THICKNESS, SECTIONS, INVERTEBRATA,

CONODONTS. UPPER CAMBRIAN. DUNDERBERG MEMBER. HALFPINT MEMBER.
SMOKY MEMBER. SEDIMENTATION. ENVIRONMENT. MARINE. SHELF. SHALLOW.
SHALE. MUDSTONE. DEPOSITION. ENVIRONMENTAL ANALYSIS
LA - EL
JC - AAPGB

AN - T74-22709
TI - THE UBEHEBE CRATERS. NORTHERN DEATH VALLEY. (INYO COUNTY) CALIFORNIA
AU - CROWE. BRUCE.
SO - MASTER'S. 1972. CALIFORNIA: SANTA BARBARA
DE - CALIFORNIA. GEOMORPHOLOGY. LANDFORM DESCRIPTION. CRATERS. SOUTHEAST. INYO COUNTY. DEATH VALLEY. UBEHEBE. UNITED STATES
LA - EL

AN - E75-21354
TI - STRATIGRAPHY AND SEDIMENTOLOGY OF THE WOOD CANYON FORMATION. DEATH VALLEY AREA. CALIFORNIA
AU - DIEHL. PAUL E.
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LA - EL

AN - E71-29118
TI - AL2SIO5 MINERALS IN ROCKS OF THE SIERRA NEVADA AND INYO MOUNTAINS. CALIFORNIA
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LA - EL
JC - AMMIA

AN - E71-07169
TI - PETROLOGY OF THE PAT KEYES PLUTON, INYO MOUNTAINS, CALIFORNIA, AND ITS RELATION TO THE SIERRA NEVADA BATHOLITH ABSTR.
AU - DUNNE, GEORGE C.
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LA - EL
JC - GAAFB

AN - E71-07171
TI - SOME LATE PRECAMBRIAN AND EARLY CAMBRIAN FOSSILS FROM THE WHITE-INYO MOUNTAINS OF CALIFORNIA ABSTR.
AU - DURHAM, J. WYATT.
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LA - EL
JC - GAAFB

AN - E71-07170
TI - A POSSIBLE MOLLUSCAN RADULA FROM THE EARLIEST CAMBRIAN OF THE WHITE-INYO MOUNTAINS, CALIFORNIA ABSTR.
AU - DURHAM, J. WYATT; FIRBY, JEAN B.
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LA - EL
JC - GAAFB

AN - E72-70248
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AU - FIFE, D. L.; GANGLOFF, R. A.; HOLDEN, J. C.
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LA - EL
JC - JPALA

AN - E73-01030
TI - POSSIBLE CEPHALOCHORDATES FROM THE LOWER CAMBRIAN ABSTR.
AU - FIRBY, JEAN B.
SO - GEOL. SOC. AM., ABSTR., VOL. 4, NO. 7, P. 504, 1972
TA - CAMPITO FORMATION, INYO-WHITE MOUNTAINS, CALIFORNIA
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LA - EL
JC - GAAPB

AN - E75-22805
TI - BROAD CORRELATIONS OF SOME LOWER AND MIDDLE CAMBRIAN STRATA IN THE NORTH AMERICAN CORDILLERA
AU - FRITZ, W. H.
SY - IN REPORT OF ACTIVITIES, APRIL TO OCTOBER 1974: STRATIGRAPHY
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LA - EL
JC - CGSPA

AN - M76-44030
TI - Archaeocyatha from California and Nevada, a challenge for the paleoecologist
AU - Gangloff, R. A.
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TA - Algae, Archaeocyatha, symbiosis, Cambrian
CC - 10
DE - ARCHAEOCYATHA, PALEOECOLOGY, ASSEMBLAGES, DISTRIBUTION, SYMBIOSIS, ALGAE, CAMBRIAN, CALIFORNIA, NEVADA, PALEONTOLOGY, WESTGARD PASS, DEATH VALLEY, MAGRUDER MOUNTAIN, SILVER PEAK, BATTLE MOUNTAIN, TOIYABE RANGE, UNITED STATES, GREAT BASIN, LOWER CAMBRIAN
LA - EL
JC - GAAPB

AN - E75-21347
TI - GUIDEBOOK; DEATH VALLEY REGION, CALIFORNIA AND NEVADA
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LA - EL

AN - U69-17742
TI - THE ORIGIN OF THE RECENT NON-MARINE EVAPORITE DEPOSIT OF SALINE VALLEY, INYO COUNTY, CALIFORNIA
AU - HARDIE, LAWRENCE A.
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DE - CALIFORNIA, SEDIMENTARY ROCKS; SEDIMENTARY PETROLOGY, EVAPORITES, INYO COUNTY, SALINE VALLEY, GENESIS, NON-MARINE
LA - EL

AN - T73-20894
TI - GEOLOGY AND GEOCHEMISTRY OF EL CAPITAN MERCURY MINE, LAST CHANCE RANGE, INYO COUNTY, CALIFORNIA
AU - HILL, ROBERT LEE.
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LA - EL

AN - E74-00713
TI - GEOMAGNETIC POLARITY TRANSITIONS ABSTR.
AU - HILLHOUSE, JOHN W.; COX, ALLAN; DENHAM, CHARLES R.; BLAKELY, RICHARD J.; BUTLER, ROBERT F.
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LA - EL
JC - EOSTA

AN - E76-28420
TI - Death Valley: geology, ecology, archaeology
AU - Hunt, C. B.
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CC - 13
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LA - EL

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AU - JENNINGS, CHARLES W. (COMPILER)
SO - CALIF. DIV. MINES GEOL., GEOL. MAPS, 1958
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LA - EL

AN - E71-35125
TI - GEOLOGY OF A PART OF THE SOUTHEASTERN SIDE OF THE COTTONWOOD MOUNTAINS, DEATH VALLEY, CALIFORNIA ABSTR.
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LA - EL
JC - DIASA

AN - E72-26873
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INYO MOUNTAINS
LA - EL
JC - XGPPA

AN - E73-17155
TI - NATURE OF THRUST FAULTING IN SOUTHERN INYO MOUNTAINS, SOUTHEASTERN CALIFORNIA ABSTR.
AU - KELLEY, JOHN S.; STEVENS, CALVIN H.
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LA - EL
JC - AAPGB

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CC - 16
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LA - EL
JC - GLGYB

AN - M74-20417
TI - PROBLEMATIC CALCAREOUS FOSSILS FROM THE STIRLING QUARTZITE, FUNERAL MOUNTAINS, INYO COUNTY, CALIFORNIA ABSTR.
AU - LANGILLE, GERALD B.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
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LA - EL
JC - GAAPB

AN - T75-09299
TI - EARLIEST CAMBRIAN: LATEST PROTEROZOIC ICHNOFOSSILS AND PROBLEMATIC FOSSILS FROM INYO COUNTY, CALIFORNIA ABSTR.
AU - LANGILLE, GERALD BURTON.
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LA - EL

AN - E74-17444
TI - GEOLOGY OF THE FURNACE CREEK BORATE AREA, DEATH VALLEY, INYO COUNTY, CALIFORNIA
AU - MCALLISTER, JAMES F.
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LA - EL
JC - CMMSA

AN - M75-00353
TI - SILURIAN, DEVONIAN, AND MISSISSIPPIAN FORMATIONS OF THE FUNERAL MOUNTAINS IN THE RYAN QUADRANGLE, DEATH VALLEY REGION, CALIFORNIA
AU - MCALLISTER, JAMES F.
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LA - EL
JC - XGLBA

AN - E75-21361
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AU - MCALLISTER, JAMES F.
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LA - EL

AN - T72-14978
TI - STRUCTURE OF THE LAST CHANCE THRUST IN THE LAST CHANCE RANGE, CALIFORNIA
AU - MCCOARD, DAVID.
SO - MASTER'S, 1970, UCLA
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LA - EL

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AU - MCKEE, EDWIN H.; GANGLOFF, ROLAND A.
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LA - EL

AN - M73-17185
TI - SILURIAN CONODONTS FROM DEATH VALLEY, CALIFORNIA ABSTR.
AU - MILLER, RICHARD H.
SO - AM. ASSOC. PET. GEOL., BULL., VOL. 57, NO. 4, P. 795, 1973
TA - HIDDEN VALLEY DOLOMITE, NEOSPATHOGATHODUS CELLONI ZONE, PTEROSPATHODUS AMORPHOGNATHOIDES ZONE, POLYGNATHUS LINGULIFORMIS, ICRIODUS LATERICRESCENS
DE - CALIFORNIA, SILURIAN, CONODONTS, STRATIGRAPHY, UNITED STATES, BIOSTRATIGRAPHY, INYO COUNTY, PANAMINT RANGE, DEATH VALLEY, HIDDEN VALLEY DOLOMITE

LA - EL
JC - AAPGB

AN - M74-20448
TI - CONODONTS AND THE ORDOVICIAN-SILURIAN BOUNDARY IN THE INYO MOUNTAINS, INYO COUNTY, CALIFORNIA ABSTR.
AU - MILLER, RICHARD H.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 6, NO. 3, P. 221, 1974
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LA - EL
JC - GAAPB

AN - M75-20281
TI - LATE ORDOVICIAN-EARLY SILURIAN CONODONT BIOSTRATIGRAPHY, INYO MOUNTAINS, CALIFORNIA
AU - MILLER, RICHARD H.
SO - GEOL. SOC. AM., BULL., VOL. 86, NO. 2, P. 159-162, ILLUS, 1975
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DE - CALIFORNIA, PALEOZOIC, CONODONTS, STRATIGRAPHY, UNITED STATES, BIOSTRATIGRAPHY, ORDOVICIAN, SILURIAN, INYO COUNTY, INYO MOUNTAINS, BOUNDARY, ELY SPRINGS DOLOMITE
LA - EL
JC - BUGMA

AN - M73-02235
TI - SILURIAN CONODONTS FROM DEATH VALLEY, CALIFORNIA; PRELIMINARY REPORT
AU - MILLER, RICHARD H.; HANNA, FRANK M.
SO - J. PALEONTOL., VOL. 46, NO. 6, P. 922-924, SKETCH MAP, 1972
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DE - CALIFORNIA, SILURIAN, CONODONTS, PALEONTOLOGY, UNITED STATES, BIOSTRATIGRAPHY, HIDDEN VALLEY DOLOMITE, DEATH VALLEY, LOST BURRO GAP
LA - EL
JC - JPALA

AN - E74-20451
TI - STRATIGRAPHIC COMPARISON OF THE PRECAMBRIAN WYMAN AND JOHNNIE FORMATIONS IN THE WESTERN GREAT BASIN, CALIFORNIA ABSTR.
AU - MOORE, JOHN N.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 6, NO. 3, P. 222-223, 1974
DE - CALIFORNIA, PRECAMBRIAN, SEDIMENTARY ROCKS, STRATIGRAPHY, UNITED STATES, LITHOFACIES, LITHOSTRATIGRAPHY, DEATH VALLEY, CORRELATION, WYMAN FORMATION, JOHNNIE FORMATION, PROVENANCE, ENVIRONMENT, MARINE, SHALLOW, ISLANDS
LA - EL
JC - GAAPB

AN - E77-03058
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AU - Morgan, N. M.
SO - Geol. Soc. Am., Abstr. Programs, Vol. 7, No. 7, p. 1205, 1975
CC - 12
DE - ARCHAEOCYATHA, PALEOECOLOGY, BIOHERMS, MORPHOLOGY, MINERAL COMPOSITION, GENESIS, CAMBRIAN, CAMPITO FORMATION, MONTENEGRO MEMBER, CALIFORNIA, STRATIGRAPHY, EAST, WHITE MOUNTAINS, INYO MOUNTAINS, UNITED STATES, LOWER CAMBRIAN
LA - EL
JC - GAAPB

AN - E74-20456
TI - PELLET-LINED BURROWS IN POLETA FORMATION (LOWER CAMBRIAN) OF WHITE-INYO MOUNTAINS, CALIFORNIA ABSTR.
AU - NATIONS, DALE; BEUS, STANLEY.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
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LA - EL
JC - GAAPB

AN - E77-03070
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AU - Nelson, C. A.
SO - Geol. Soc. Am., Abstr. Programs, Vol. 7, No. 7, p. 1211, 1975
CC - 12
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LA - EL
JC - GAAPB

AN - E72-15069
TI - STRUCTURE AND EMPLACEMENT HISTORY OF PAPOOSE FLAT PLUTON, INYO MOUNTAINS, CALIFORNIA ABSTR.
AU - NELSON, C. A.; OERTEL, G.; CHRISTIE, J. M.; SYLVESTER, A. G.
SY - IN CORDILLERAN SECTION, 68TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 4, NO. 3, P. 208-209, 1972
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LA - EL
JC - GAAPB

AN - E74-19010
TI - UNFOLDING OF AN ANTIFORM BY THE REVERSAL OF OBSERVED STRAINS
AU - OERTEL, GERHARD.
SO - GEOL. SOC. AM., BULL., VOL. 85, NO. 3, P. 445-450, ILLUS. (INCL. GEOL. SKETCH MAP), 1974
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LA - EL
JC - BUGMA

AN - T72-15001
TI - GEOLOGY OF THE NORTHWESTERN INYO MOUNTAINS, INYO COUNTY, CALIFORNIA
AU - OLSON, ROBERT.
SO - MASTER'S, 1970
DE - CALIFORNIA, UNITED STATES, AREAL GEOLOGY, INYO COUNTY, INYO MOUNTAINS
LA - EL

AN - E70-10853
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AU - OLSON, ROBERT C.
SO - GEOL. SOC. AMER., ABSTR., VOL. 2, NO. 2, P. 128, 1970
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LA - EL

AN - E74-20470
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AU - OTTON, JAMES K.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 6, NO. 3, P. 233, 1974
DE - CALIFORNIA, PRECAMBRIAN, METAMORPHIC ROCKS, PHANEROZOIC, INTRUSIONS, FOLDS, FAULTS, AREAL GEOLOGY, UNITED STATES, AGE, STYLE, DISPLACEMENTS, PETROLOGY, STRUCTURAL GEOLOGY, STRATIGRAPHY, SOUTHEAST, INYO COUNTY, DEATH VALLEY, BLACK MOUNTAINS, PAHRUMP GROUP, GNEISSES, SCHISTS, QUARTZITE, MARBLE, PLUTONS, DIKES, ANTICLINAL, NORMAL
LA - EL
JC - GAAFB

AN - E75-21357
TI - GEOLOGIC FEATURES OF THE CENTRAL BLACK MOUNTAINS, DEATH VALLEY, CALIFORNIA
AU - OTTON, JAMES K.
SY - IN GUIDEBOOK; DEATH VALLEY REGION, CALIFORNIA AND NEVADA (SEE GEOLOGICAL SOCIETY OF AMERICA), P. 65-72, ILLUS. (INCL. GEOL. SKETCH MAPS)
SO - DEATH VALLEY PUBL. CO., SHOSHONE, CALIFORNIA, 1974
DE - CALIFORNIA, MAPS, METAMORPHIC ROCKS, IGNEOUS ROCKS, AREAL GEOLOGY, CARTOGRAPHY, MARBLES, PETROLOGY, SEDIMENTARY PETROLOGY, STRATIGRAPHY, STRUCTURAL GEOLOGY, EAST, INYO COUNTY, DEATH VALLEY, BLACK MOUNTAINS, GEOLOGIC, UNITED STATES, CORRELATION, PRECAMBRIAN, DIORITE, GRANITE, MONZONITE, LATITE, VOLCANIC, PLUTONS, DIKES, MESOZOIC, CENOZOIC
LA - EL

AN - T71-61413
TI - STRATIGRAPHY AND STRUCTURAL GEOLOGY OF TITUS AND TITANOTHERE CANYONS AREA, DEATH VALLEY (INYO COUNTY), CALIFORNIA
AU - REYNOLDS, MITCHELL W.
SO - DOCTORAL, 1969
DE - CALIFORNIA, TECTONICS, STRUCTURAL GEOLOGY, STRATIGRAPHY, UNITED STATES, INYO COUNTY, DEATH VALLEY, TITUS CANYON, TITANOTHERE CANYON
LA - EL

AN - E75-21363
TI - GEOLOGY OF THE GRAPEVINE MOUNTAINS, DEATH VALLEY, CALIFORNIA; A SUMMARY
AU - REYNOLDS, MITCHELL W.
SY - IN GUIDEBOOK: DEATH VALLEY REGION, CALIFORNIA AND NEVADA (SEE GEOLOGICAL SOCIETY OF AMERICA), P. 91-97, ILLUS. (INCL. GEOL. SKETCH MAP)
SO - DEATH VALLEY PUBL. CO., SHOSHONE, CALIFORNIA, 1974
DE - CALIFORNIA, PRECAMBRIAN, PHANEROZOIC, AREAL GEOLOGY, UNITED STATES, STRATIGRAPHY, STRUCTURAL GEOLOGY, EAST, INYO COUNTY, DEATH VALLEY, GRAPEVINE MOUNTAINS, LITHOSTRATIGRAPHY, SEDIMENTARY ROCKS, IGNEOUS ROCKS, FAULTS, FOLDS, PALEOZOIC, MESOZOIC, CENOZOIC
LA - EL

AN - E70-10091
TI - STRATIGRAPHY AND STRUCTURAL GEOLOGY OF THE TITUS AND TITANOTHERE CANYONS AREA, DEATH VALLEY, CALIFORNIA ABSTR.
AU - REYNOLDS, MITCHELL WILLIAM.
SO - DISS. ABSTR. INT., VOL. 30, NO. 5, P. 2257B, 1969
DE - CALIFORNIA, CAMBRIAN, QUATERNARY, PRECAMBRIAN, TERTIARY, FAULTS, TECTONICS, STRATIGRAPHY, SYSTEMS, DEATH VALLEY, TITUS CANYON, TITANOTHERE CANYON
LA - EL

AN - E70-10869
TI - PALEOZOIC SUBMARINE ROCKSLIDE DEPOSITS, INYO MOUNTAINS, CALIFORNIA ABSTR.
AU - RIDLEY, ALBERT P.
SO - GEOL. SOC. AMER., ABSTR., VOL. 2, NO. 2, P. 136, 1970
DE - CALIFORNIA, SEDIMENTARY ROCKS, SEDIMENTATION, SEDIMENTARY PETROLOGY, GENESIS, ENVIRONMENT, INYO MOUNTAINS, PERDIDO FORMATION, ROCKSLIDE, MARINE
LA - EL

AN - T72-36792
TI - DEVONIAN AND MISSISSIPPIAN SEDIMENTATION AND STRATIGRAPHY OF THE MAZOURKA CANYON AREA, INYO MOUNTAINS, INYO COUNTY, CALIFORNIA
AU - RIDLEY, ALBERT PAUL.
SO - MASTER'S, 1971
DE - CALIFORNIA, DEVONIAN, MISSISSIPPIAN, STRATIGRAPHY, UNITED STATES, INYO MOUNTAINS, INYO COUNTY, MAZOURKA CANYON, SEDIMENTATION
LA - EL

AN - T76-25110
TI - The stratigraphy and depositional environments of the lower part of the Crystal Spring Formation, Death Valley, California
AU - Roberts, M. T.
SO - Doctoral, 1974, Penn State, Diss. Abstr. Int., Vol. 36, No. 3, p. 1107B-1108B, 1975
CC - 06
DE - CALIFORNIA, SEDIMENTARY PETROLOGY, SEDIMENTATION, CLASTICS, TERRIGENOUS, UPPER PRECAMBRIAN, CRYSTAL SPRING FORMATION, EAST, INYO COUNTY, DEATH VALLEY, UNITED STATES, TECTONICS, STRATIGRAPHY, ENVIRONMENT, BASINS, NEARSHORE, ESTUARIES, RIVERS, DEPOSITION, CYCLIC, CURRENT DIRECTIONS, PROVENANCE, SEDIMENTARY ROCKS, CONGLOMERATE, SANDSTONE, SILTSTONE, SHALE, MUDSTONE, ENVIRONMENTAL ANALYSIS, THICKNESS
LA - EL

AN - E75-21355
TI - STRATIGRAPHY AND DEPOSITIONAL ENVIRONMENTS OF THE CRYSTAL SPRING FORMATION, SOUTHERN DEATH VALLEY REGION, CALIFORNIA
AU - ROBERTS, MICHAEL T.
SY - IN GUIDEBOOK; DEATH VALLEY REGION, CALIFORNIA AND NEVADA (SEE GEOLOGICAL SOCIETY OF AMERICA), P. 49-57, ILLUS. (INCL. SKETCH MAPS)
SO - DEATH VALLEY PUBL. CO., SHOSHONE, CALIFORNIA, 1974
DE - CALIFORNIA, PRECAMBRIAN, SEDIMENTATION, STRATIGRAPHY, UNITED STATES, ENVIRONMENT, CRYSTAL SPRINGS FORMATION, EAST, INYO COUNTY, DEATH VALLEY, LITHOSTRATIGRAPHY, PALEOGEOGRAPHY, PALEOCURRENTS, SECTIONS, SEDIMENTARY ROCKS, BASINS, TERRESTRIAL, SEDIMENTARY STRUCTURES, ICHNOFOSSILS, CLASTICS
LA - EL

AN - E70-32695
TI - PEGMATITIC TRACHYANDESITE PLUGS AND ASSOCIATED VOLCANIC ROCKS IN THE SALINE RANGE-INYO MOUNTAINS REGION, CALIFORNIA
AU - ROSS, DONALD C.
SO - U. S. GEOL. SURV., PROF. PAP., NO. 614-D, 29 P., ILLUS. (INCL. COLORED GEOL. MAPS), 1970
TA - TERTIARY VOLCANIC PLUGS, PEGMATITIC CORES, MIAROLITIC TEXTURES, FINER-GRAINED MARGINAL ROCKS, PILOTAXITIC TEXTURE, CHEMICAL DATA (WITH ANALYSES), MINOR-ELEMENT AND TRACE-ELEMENT TRENDS, REGIONAL INDICATIONS OF ALKALIC VOLCANIC PROVINCE
DE - CALIFORNIA, IGNEOUS ROCKS, INTRUSIONS, PETROLOGY, VOLCANICS, PLUGS, TRACHYANDESITE, SALINE RANGE, INYO MOUNTAINS
LA - EL
JC - XGPPA

AN - E76-14256
TI - Variations in surface roughness within Death Valley, California: geologic evaluation of 25-cm-wavelength radar images
AU - Schaber, G. G.; Berlin, G. L., Brown, W. E., Jr.
SO - Geol. Soc. Am., Bull., Vol. 87, No. 1, p. 29-41, illus. (incl. geol. sketch map), 1976
CC - 23
DE - CALIFORNIA, GEOMORPHOLOGY, LANDFORM DESCRIPTION, DESERTS, EAST, INYO COUNTY, DEATH VALLEY, GEOPHYSICAL METHODS, ELECTROMAGNETIC METHODS, RADAR, SIDE-SCANNING, AIRBORNE, REMOTE SENSING, BACKSCATTER, CORRELATION, ROUGHNESS, SURFACE, CALIBRATION, UNITS, GEOLOGIC, EVALUATION, GRAVEL FANS, SALT FLATS, SEDIMENTS, MODELS, UNITED STATES
LA - EL
JC - BUGMA

AN - E76-27021
TI - Variations in surface roughness within Death Valley, California: geologic evaluation of 25 cm wavelength radar images
AU - Schaber, G. G.; Berlin, G. L.; Brown, W. E., Jr.
SO - Am. Soc. Photogramm., Fall Conv., Proc., Vol. 1975, p. 230, 1975
CC - 20
DE - CALIFORNIA, GEOPHYSICAL SURVEYS, PHOTOGRAMMETRY, DEATH VALLEY, UNITED STATES, RADAR, SIDE-SCANNING, BACKSCATTER, APPLICATIONS, ROUGHNESS, GRAINS, SIZE, LITHOLOGY
LA - EL

AN - E71-32547
TI - NORMAL SEA-FLOOR CURRENTS IN SUBMARINE CANYONS ABSTR.
AU - SHEPARD, F. P.; MARSHALL, N. F.
SO - GEOL. SOC. AM., ABSTR., VOL. 3, NO. 7, P. 701, 1971
DE - CALIFORNIA, MEXICO, CONTINENTAL SHELF, MARINE GEOLOGY, UNITED STATES, CURRENTS, LA JOLLA CANYON, BAJA CALIFORNIA, SAN LUCAS CANYON, EXPERIMENTAL STUDIES
LA - EL
JC - GAAFB

AN - T71-61898
TI - STRUCTURE AND CONTACT METAMORPHISM OF CALC-SILICATE ROCKS, INYO MOUNTAINS, CALIFORNIA
AU - SIMONDS, CHARLES H.
SO - MASTER'S, 1969
DE - CALIFORNIA, METAMORPHISM, METAMORPHIC ROCKS, PETROLOGY, CONTACT, STRUCTURE, INYO MOUNTAINS, CALC-SILICATE ROCKS, UNITED STATES
LA - EL

AN - E76-40973
TI - Structural and paleomagnetic studies of upper Cambrian diabases from Death Valley, California
AU - Spall, H.; Troxel, B. W.
SO - Geol. Soc. Am., Abstr. Programs, Vol. 6, No. 7, p. 963, 1974
CC - 12
DE - CALIFORNIA, STRATIGRAPHY, CAMBRIAN, PALEOMAGNETISM, SOUTHEAST, INYO COUNTY, DEATH VALLEY, BLACK MOUNTAINS, IGNEOUS ROCKS, BASALT FAMILY, DIABASE, AGE, UNITED STATES, NATURAL REMANENT MAGNETIZATION, TECTONICS, UPPER CAMBRIAN
LA - EL
JC - GAAPB

AN - E74-20518
TI - PALEOMAGNETISM OF LATE PRECAMBRIAN BASIC INTRUSIVES IN THE WESTERN U.S. ABSTR.
AU - SPALL, HENRY.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 6, NO. 3, P. 259, 1974
DE - UNITED STATES, PALEOMAGNETISM, PRECAMBRIAN, IGNEOUS ROCKS, STRATIGRAPHY, BASALT FAMILY, WEST, TEXAS, FRANKLIN MOUNTAINS, ARIZONA, SIERRA ANCHA, SALT RIVER, CALIFORNIA, DEATH VALLEY, POLE POSITIONS, DIABASE, INTRUSIONS
LA - EL
JC - GAAPB

AN - E70-10897
TI - PERMO-PENNSYLVANIAN OFF-SHELF DEPOSITS, EASTERN CALIFORNIA ABSTR.
AU - STEVENS, CALVIN H.
SO - GEOL. SOC. AMER., ABSTR., VOL. 2, NO. 2, P. 148-149, 1970
DE - INVERTEBRATA, PENNSYLVANIAN, PALEOECOLOGY, PERMIAN, CALIFORNIA, PALEONTOLOGY, KEELER CANYON FORMATION, INYO MOUNTAINS
LA - EL

AN - E72-35198
TI - NATURE AND SIGNIFICANCE OF THE INYO THRUST FAULT, EASTERN CALIFORNIA
AU - STEVENS, CALVIN H.; OLSON, ROBERT C.
SO - GEOL. SOC. AM., BULL., VOL. 83, NO. 12, P. 3761-3768, ILLUS. (INCL. GEOL. SKETCH MAP), 1972
TA - A MISSISSIPPIAN-PERMIAN SECTION OVERLAIN BY A PRECAMBRIAN-ORDOVICIAN SECTION, POSSIBLE DISPLACEMENT OF 17 MILES, NORTHERN INYO AND SOUTHERN WHITE MOUNTAINS
DE - CALIFORNIA, FAULTS, TECTONICS, STRUCTURAL GEOLOGY, DISPLACEMENTS, STRUCTURE, INYO MOUNTAINS, WHITE MOUNTAINS, OVERTHRUST, ALLOCHTHONS, UNITED STATES
LA - EL

JC - BUGMA

AN - E74-09893
TI - MIDDLE PALEOZOIC OFF-SHELF DEPOSITS IN SOUTHEASTERN CALIFORNIA; EVIDENCE FOR PROXIMITY OF THE ANTLER OROGENIC BELT?
AU - STEVENS, CALVIN H.; RIDLEY, ALBERT P.
SO - GEOL. SOC. AM., BULL., VOL. 85, NO. 1, P. 27-32, ILLUS. (INCL. GEOL. SKETCH MAP), 1974
TA - TWO SEQUENCES, SILURIAN-MIDDLE DEVONIAN CALCAREOUS SEQUENCE, UPPER DEVONIAN(?) - MISSISSIPPIAN CLASTICS, FACIES, PALEOSLOPE, PROVENANCE, SUBMARINE DEBRIS FLOWS, TURBIDITY CURRENTS, PRESENCE OF CONGLOMERATE IS NO EVIDENCE OF PROXIMITY
DE - CALIFORNIA, PALEOZOIC, SEDIMENTATION, SEDIMENTARY ROCKS, PALEOGEOGRAPHY, STRATIGRAPHY, UNITED STATES, ENVIRONMENT, LITHOFACIES, SOUTHEAST, INYO MOUNTAINS, WEST-CENTRAL, MIDDLE PALEOZOIC, SILURIAN, DEVONIAN, MISSISSIPPIAN, MARINE, TURBIDITY CURRENTS, DEBRIS FLOWS, CHANNELS, PROVENANCE, CALCAREOUS, CONGLOMERATE, CLASTICS, ANTLER OROGENIC BELT
LA - EL
JC - BUGMA

AN - E74-20526
TI - LANDSLIDES CONTROLLED BY OVERTURNED ANTICLINAL FOLDS, EAST CENTRAL INYO MOUNTAINS, CALIFORNIA ABSTR.
AU - STOUT, MARTIN L.; WEICK, RODNEY J.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 6, NO. 3, P. 263, 1974
DE - CALIFORNIA, GEOMORPHOLOGY, FOLDS, MASS MOVEMENTS, STYLE, LANDSLIDES, EAST-CENTRAL, INYO COUNTY, INYO MOUNTAINS, LEAD CANYON, STRUCTURAL CONTROLS, ANTICLINAL, OVERTURNED, UNITED STATES
LA - EL
JC - GAAPB

AN - N69-10540
TI - THE ORIGIN OF CROSS-GIRDLE ORIENTATIONS OF OPTIC AXES IN DEFORMED QUARTZITES
AU - SYLVESTER, A. G.; CHRISTIE, J. M.
SO - J. GEOL., VOL. 76, NO. 5, P. 571-580, ILLUS., 1968
TA - CONTACT AUREOLE, PAPOOSE FLAT GRANITIC PLUTON, INYO MOUNTAINS, CALIFORNIA
DE - CALIFORNIA, METAMORPHIC ROCKS, METAMORPHISM, PETROLOGY, QUARTZITE, CONTACT, INYO MOUNTAINS, CROSS-GIRDLE ORIENTATION, OPTIC AXES, GENESIS-PROPERTIES, FOLIATION-LINEATION GENESIS
LA - EL

AN - E77-03225
TI - Regional significance of multiphase folding in the White-Inyo Range, eastern California
AU - Sylvester, A. G; Babcock, J. W.
SO - Geol. Soc. Am., Abstr. Programs, Vol. 7, No. 7, p. 1289, 1975
CC - 16
DE - CALIFORNIA, STRUCTURAL GEOLOGY, FOLDS, SYSTEMS, WHITE MOUNTAINS, INYO MOUNTAINS, GEOMETRY, ORIENTATION, AGE, MULTIPHASE, PALEOZOIC, MESOZOIC, UNITED STATES
LA - EL
JC - GAAPB

AN - E75-21362
TI - SIGNIFICANCE OF A MAN-MADE DIVERSION OF FURNACE CREEK WASH AT ZABRISKIE POINT, DEATH VALLEY, CALIFORNIA
AU - TROXEL, B. W.
SY - IN GUIDEBOOK; DEATH VALLEY REGION, CALIFORNIA AND NEVADA (SEE GEOLOGICAL SOCIETY OF AMERICA), P. 87-90, ILLUS.
SO - DEATH VALLEY PUBL. CO., SHOSHONE, CALIFORNIA, 1974
DE - CALIFORNIA, ENVIRONMENTAL GEOLOGY, GEOLOGIC HAZARDS, FLOODS, EAST, INYO COUNTY, DEATH VALLEY, ZABRISKIE POINT, FURNACE CREEK WASH, CONTROLS, DIVERSION, EFFECTS, UNITED STATES
LA - EL

AN - E77-01668
TI - Geologic features of Death Valley
AU - Troxel, B. W.
SO - Calif. Geol., Vol. 29, No. 8, p. 182-183, illus., 1976
TA - Description of two photographs published in U. S. Geological Survey Professional Paper 590 by Denny, C. S., et al.
CC - 23
DE - CALIFORNIA, GEOMORPHOLOGY, LANDFORM DESCRIPTION, INYO COUNTY, DEATH VALLEY, BADWATER BASIN, COPPER CANYON, CANYONS, STREAMS, CHANNELS, GULLIES, ALLUVIAL FANS, EROSION
LA - EL
JC - CGEOA

AN - E76-42393
TI - Fossil mammals of the Indian Wells Valley region and how to collect them
AU - von Huene, R.
SO - Maturango Mus., 18 p., illus., China Lake, Calif., United States, 1971, Publication 5
CC - 11
DE - CALIFORNIA, PALEONTOLOGY, MAMMALIA, CENOZOIC, INDIAN WELLS VALLEY, CHINA LAKE, EL PASO MOUNTAINS, DEATH VALLEY, TEHACHAPI MOUNTAINS, MOJAVE DESERT, COSO MOUNTAIN, WHITE HILLS, BAKERSFIELD, UNITED STATES, DISTRIBUTION

LA - EL

AN - T72-35794
TI - PETROLOGY AND STRUCTURAL GEOLOGY OF IGNEOUS AND METAMORPHIC ROCKS, WEST SIDE OF EUREKA VALLEY, INYO MOUNTAINS, CALIFORNIA
AU - WARNER, EDWARD MARK,
SO - MASTER'S, 1971, UCLA
DE - CALIFORNIA, IGNEOUS ROCKS, METAMORPHIC ROCKS, TECTONICS, AREAL GEOLOGY, PETROLOGY, UNITED STATES, STRUCTURAL GEOLOGY, INYO MOUNTAINS, EUREKA VALLEY
LA - EL

AN - E73-12319
TI - OCCURRENCE AND IMPLICATIONS OF TRACE FOSSILS IN THE LOWER CAMBRIAN OF THE WHITE-INYO MOUNTAINS, CALIFORNIA ABSTR.
AU - WIGGETT, GAIL J.
SY - IN CORDILLERAN SECTION, 69TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 5, NO. 1, P. 122, 1973
TA - UPPER POLETA FORMATION, WYATTIA, BEHAVIORAL PATTERNS, MORPHOLOGY
DE - CALIFORNIA, CAMBRIAN, ICHNOFOSSILS, PALEONTOLOGY, UNITED STATES, TRACKS AND TRAILS, WHITE MOUNTAINS, INYO MOUNTAINS, LOWER CAMBRIAN, MORPHOLOGY, DISTRIBUTION, GENESIS
LA - EL
JC - GAAFB

AN - E75-21358
TI - THE NOONDAY DOLOMITE AND EQUIVALENT STRATIGRAPHIC UNITS, SOUTHERN DEATH VALLEY REGION, CALIFORNIA
AU - WILLIAMS, E. G., WRIGHT, LAUREN A.; TROXEL, B. W.
SY - IN GUIDEBOOK; DEATH VALLEY REGION, CALIFORNIA AND NEVADA (SEE GEOLOGICAL SOCIETY OF AMERICA), P. 73-77, ILLUS. (INCL. GEOL. SKETCH MAP)
SO - DEATH VALLEY PUBL. CO., SHOSHONE, CALIFORNIA, 1974
DE - CALIFORNIA, PRECAMBRIAN, STRATIGRAPHY, UNITED STATES, NOONDAY DOLOMITE, EAST, INYO COUNTY, DEATH VALLEY, LITHOSTRATIGRAPHY, LITHOFACIES, DOLOMITE, PALEOGEOGRAPHY, BASINS
LA - EL

AN - E71-15233
TI - VERTEBRATE PALEONTOLOGY OF THE NORTHERN MOJAVE DESERT, SOUTHERN CALIFORNIA; FIELD TRIP GUIDE FROM DEATH VALLEY TO RIVERSIDE, CALIFORNIA
AU - WOODBURNE, M. O.
SY - IN GEOLOGICAL EXCURSIONS IN SOUTHERN CALIFORNIA
SO - J. EARTH SCI., NO. 1, P. 43-58, ILLUS. (INCL. SKETCH MAP), 1971
TA - LOCALITIES AND FAUNAL LISTS, NO SYSTEMATIC DESCRIPTIONS
DE - CALIFORNIA, VERTEBRATA, TERTIARY, PALEONTOLOGY, UNITED STATES,

MOJAVE DESERT, DEATH VALLEY
LA - EL
JC - 002056

AN - E75-21352
TI - PRECAMBRIAN SEDIMENTARY ENVIRONMENTS OF THE DEATH VALLEY REGION, EASTERN CALIFORNIA
AU - WRIGHT, L. A.; TROXEL, B. W.; WILLIAMS, E. G.; ROBERTS, M. T.; DIEHL, PAUL E.
SY - IN GUIDEBOOK; DEATH VALLEY REGION, CALIFORNIA AND NEVADA (SEE GEOLOGICAL SOCIETY OF AMERICA), P. 27-36, ILLUS. (INCL. SKETCH MAPS)
SO - DEATH VALLEY PUBL. CO., SHOSHONE, CALIFORNIA, 1974
DE - CALIFORNIA, PRECAMBRIAN, SEDIMENTATION, STRATIGRAPHY, UNITED STATES, ENVIRONMENT, PALEOGEOGRAPHY, EAST, INYO COUNTY, DEATH VALLEY, LITHOSTRATIGRAPHY, SEDIMENTARY ROCKS, TECTONICS, PAHRUMP GROUP, NOONDAY DOLOMITE, JOHNNIE FORMATION, STIRLING QUARTZITE, WOOD CANYON FORMATION, GEOSYNCLINES, MIOGEOSYNCLINES, UPLANDS, AULACOGENS
LA - EL

AN - E75-21351
TI - GEOLOGIC MAP OF THE REGION OF CENTRAL AND SOUTHERN DEATH VALLEY, EASTERN CALIFORNIA AND SOUTHWESTERN NEVADA
AU - WRIGHT, LAUREN A. (COMPILER).
SY - IN GUIDEBOOK; DEATH VALLEY REGION, CALIFORNIA AND NEVADA (SEE GEOLOGICAL SOCIETY OF AMERICA), P. 25
SO - DEATH VALLEY PUBL. CO., SHOSHONE, CALIFORNIA, 1974
DE - CALIFORNIA, NEVADA, MAPS, AREAL GEOLOGY, UNITED STATES, EAST, INYO COUNTY, DEATH VALLEY, WEST, NYE COUNTY, GEOLOGIC
LA - EL

AN - E74-20555
TI - DOLOMITE "DIKES" IN THE UPPER WYMAN FORMATION (PRECAMBRIAN), NORTHEASTERN INYO MOUNTAINS, CALIFORNIA ABSTR.
AU - ZENGER, DONALD H.
SY - IN CORDILLERAN SECTION, 70TH ANNUAL MEETING
SO - GEOL. SOC. AM., ABSTR., VOL. 6, NO. 3, P. 279, 1974
DE - PRECAMBRIAN, CALIFORNIA, SEDIMENTARY ROCKS, METASOMATISM, UNITED STATES, SEDIMENTARY PETROLOGY, CARBONATE ROCKS, MATERIALS, DOLOMITE, LIMESTONE, WYMAN FORMATION, SOUTHEAST, INYO COUNTY, INYO MOUNTAINS, OPAL CANYON, GENESIS, HYDROTHERMAL ALTERATION, HYDROTHERMAL PROCESSES, DOLOMITIZATION
LA - EL
JC - GAAPB

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APPENDIX V

REPORT ON LEASEABLE RESOURCES

UNITED STATES
DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY
Conservation Division
Area Geologist's Office
345 Middlefield Road
Menlo Park, California 94025

February 8, 1977

Memorandum

To: Neil B. Pfulb, Director California Desert Plan
Attn: Chuck Sabine

Through: Area Geologist, Pacific Area Henry Cullins

From: Jack A. Crowley, Menlo Park

The following is an abstract of the formal report now being prepared for the Bureau of Land Management pertaining to your classification of the California Desert Lands, in respect to the leasable mineral commodities in the Saline Valley planning unit.

Within the Saline Valley planning unit, the leasable commodities identified to date are geothermal resources and sodium and potassium.

Geothermal resources are identified on the accompanying map (Figure 1) showing the boundary of the Saline Valley K.G.R.A. and the boundary for the prospectively valuable geothermal lands. A copy of the Saline Valley K.G.R.A. minutes are attached (attachment 1). The Saline Valley K.G.R.A. was defined on the basis of competitive interest only. Hot and warm springs are present in Saline Valley, both within the K.G.R.A. and in the prospectively valuable for geothermal resources area. These springs (total of seven) were sampled the week of February 1-4, 1977 by the Water Resources Division, Geological Survey. The analyses will be completed within about two weeks, and these will be included in the forthcoming report.

The second leasable commodity group in Saline Valley is sodium and potassium. Saline Valley has been considered to have a commercial potential for sodium and potassium since the turn of the century. At different times various groups have actively mined sodium minerals from the surface salt crust and surface and near surface brines. The present classification of valuable for sodium lands and prospectively valuable for sodium lands has been based on the surface occurrence of sodium minerals. Detailed brine analysis and drill hole information was totally lacking. As a result of the request from the Bureau of Land Management for hard data on sodium occurrences in Saline Valley, the Conservation Division conducted a geologic investigation and a small drilling operation in the Valley. Four of the eight drilling locations were approved by B.L.M., unfortunately three of these were at locations

judged to have the least likelyhood of interdicting a salt body at depth. Three holes were subsequently drilled at two locations (figure 2). Holes SV-1 and SV-1A were drilled about 300 feet south of the present salt lake margin on the north border of the NE¼SW¼, Sec.26, T.14S., R.38E. M.D.M. and hole SV-2 was drilled about 150 feet west of the margin of the present salt lake in the SE¼SE¼ Sec.22, T.14S., R.38E., M.D.M.

Hole SV-1 was drilled without coring to establish whether any salt bodies exist at depth. The hole was completed to a depth of 275 feet. Brine was present from 3 feet to 30 feet. Below this depth no brine layers were encountered. This near surface brine is apparently a sodium chloride, sodium sulfate brine and is near saturation with respect to sodium sulfate, as refrigeration of the brine results in abundant crystallization of mirabilite. The first solid salt horizons were penetrated at 60 feet. Abundant salt horizons were encountered from 60 to 240 feet. At 240 feet a damp, impermeable, gray, carbonate clay was encountered. No salt horizons were penetrated from 240 - 275 feet. Hole SV-1A was drilled 35 feet north of SV-1. Several coring runs were carried out during the drilling of this hole. This hole was drilled to a total depth of 315 feet. Abundant salt-bearing horizons were encountered from 60 feet to 258 feet. Core recovery was poor due to the small core size (two inch) and the very coarse grained and vuggy salts encountered from 120 feet to 258 feet. Much of the salt kibbled and then fell out of the core barrel while pulling the string for the core. Hole SV-2 was completed to a total depth of 195 feet where a boulder conglomerate was hit, apparently the upper surface of an alluvial fan. Salt plus gravel layers were encountered from 12 feet to 35 feet. No salt layers were encountered below 35 feet. The mineralogy of the crystallized salts shows that the solid salt layers are dominantly sodium sulfate salts, with lesser amounts of chloride and small amounts of borate and potassium salts. The successful drilling of these three holes, all of which penetrated salt bodies on the very edge of the playa, has established the fact that a large, potentially commercial salt body does exist in Saline Valley. These holes also justify the present land classification in Saline Valley of valuable for sodium.

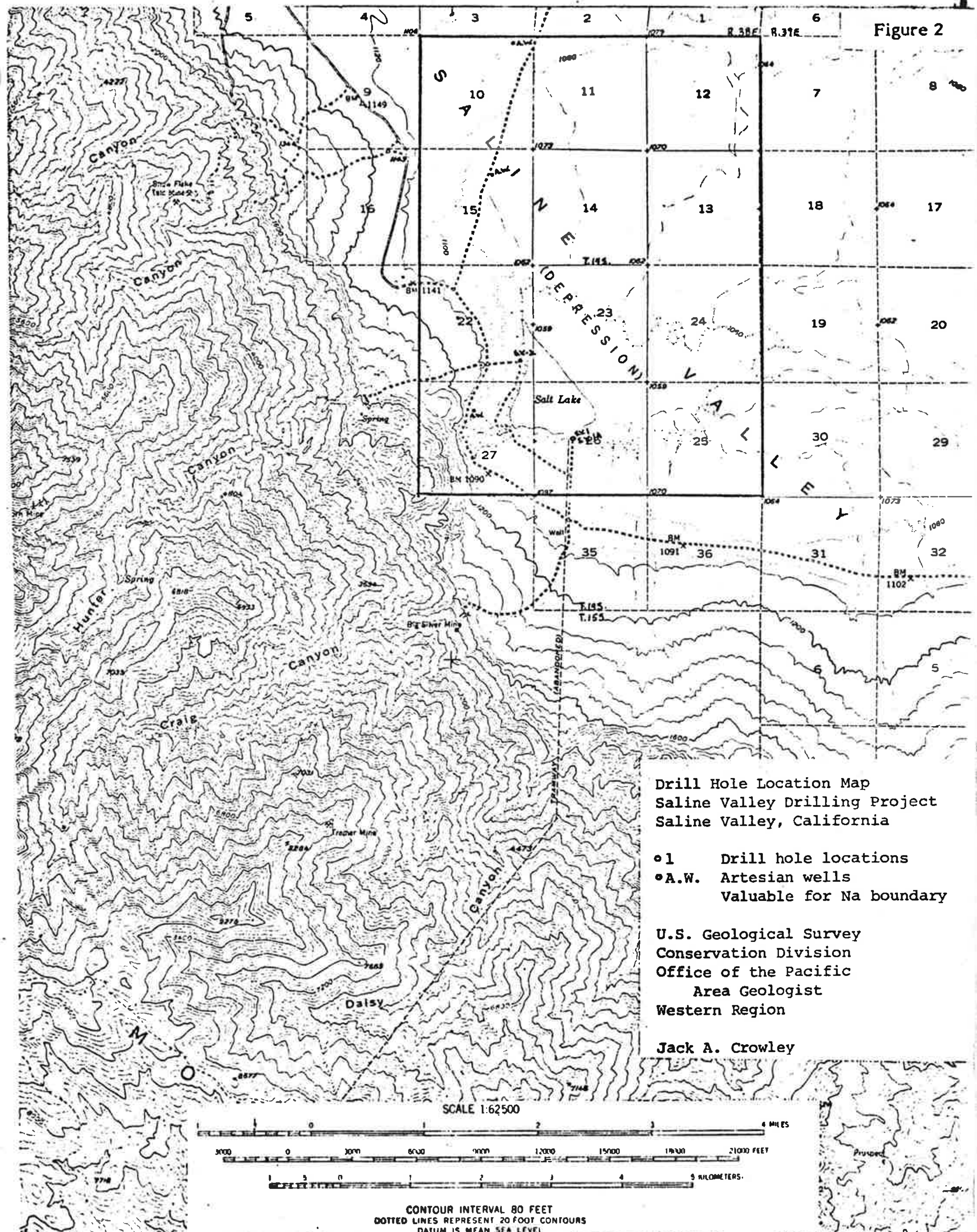
Detailed analyses of the brine encountered, and the composition of the muds and salts are being conducted. Gamma ray, resistivity, and self potential geophysical logs have been conducted on holes SV-1A and SV-2. A caliper log was also run on both holes. The results of these analyses will be incorporated in the main report.

As a result of the geologic investigations of the Saline Valley playa area, the prospectively valuable for sodium and the valuable for sodium boundaries will be revised (figures 3 and 4).

Jack A. Crowley

Jack A. Crowley

Figure 2



Drill Hole Location Map
Saline Valley Drilling Project
Saline Valley, California

- °1 Drill hole locations
- °A.W. Artesian wells
- Valuable for Na boundary

U.S. Geological Survey
Conservation Division
Office of the Pacific
Area Geologist
Western Region

Jack A. Crowley

File: California Known Geothermal Resources Area Minutes No. 28

in alluvium. A few hot springs and fossil hot spring deposits are located near the lava-alluvium contact along the west side of the side valley where the proposed KGRA is located. The water of the springs is of low salt content and quite potable. Water temperature is in the vicinity of 55°-65°C.

Basis for Evaluation

The proposed Saline Valley KGRA as described in these minutes has been evaluated solely on the basis of competitive interest as defined in 43CFR 3200.0-5(k)(3). Inasmuch as this determination is based upon competitive interest, it is recommended that the date that such competitive interest became known February 1, 1974, be the effective date of this action.

Description of Land

Based on the foregoing information, the following described lands embracing 3,200 acres, more or less, are recommended as the Saline Valley Known Geothermal Resources Area:

T. 13 S., R. 39 E. - Mt. Diablo Meridian
Secs. 19, 20, 21, 29, 30 - All

Submitted and recommended by the Committee

Member

William H. Lee
Member

Henry L. Cullins
Chairman

Minutes prepared by J. A. Crowley

Reviewed by: Elizabeth L. H. Newton Date: 12-9-75

Approved by:

Willard C. Cere
Willard C. Cere
Conservation Manager
Western Region

Date: [illegible]

CC: Chief, Cons. Div. (MD640) (2)
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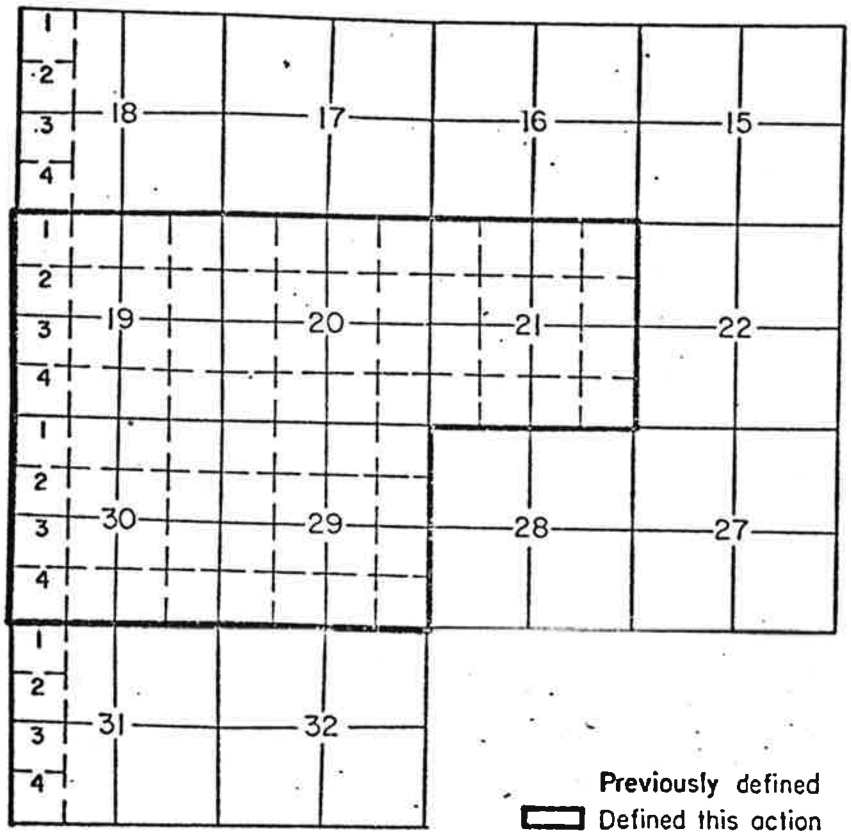
Dist. Geologist, L. A.
L. J. P. Muffler, Geol. Div., M. P.

JAC:jb

SALINE VALLEY K.G.R.A.

T. 13 S., R. 39 E., Mount Diablo Meridian, California



	Previously defined	0
▭	Defined this action	3,200
	Total defined	3,200 acres

Pursuant to the authority vested in the Secretary of the Interior by Sec. 21(a) of the Geothermal Steam Act of 1970 (84 Stat. 1566, 1572; 30 U.S.C. 1020), and delegations of authority in 220 Departmental Manual 4.1H, Geological Survey Manual 220.2.3, and Conservation Division Supplement (Geological Survey Manual) 220.2.1G, I defined the

SALINE VALLEY

known geothermal resources area as indicated hereon, effective February 1, 1974

Conservation Manager
U.S. Geological Survey
December 9, 1975 Date

LOCATION AND GEOLOGIC MAP

SALINE VALLEY KGRA

U. S. GEOLOGICAL SURVEY
CONSERVATION DIVISION
OFFICE OF THE PACIFIC AREA GEOLOGIST

Compiled by Jack A. Crowley

July, 1975

Scale 1:62,500

EXPLANATION

Qal	Quaternary alluvial, lacustrine, colluvial and spring deposits.
Czt	Late Cenozoic trachyandesite
Czfv Czf	Late Cenozoic felsic volcanic rocks and fanglomerate
Mzgm	Mesozoic quartz manzonite
Pzs	Paleozoic sedimentary rocks, undivided
	Fault; ball indicates downthrown side, dashed where approximately located, dotted where concealed
	KGRA boundary

Geologic map compiled from Burchfiel, B. C., 1969; Ross, P. C., 1967a, 1967b, 1970.

LEASABLE COMMODITIES OF THE SALINE VALLEY PLANNING UNIT, INYO COUNTY, CALIFORNIA

by
Jack A. Crowley

September 1977

ADMINISTRATIVE REPORT -- FOR OFFICIAL USE ONLY

U.S. Geological Survey
Conservation Division
Office of the Pacific Area Geologist
Menlo Park, California

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INTRODUCTION

The purpose of this study is to locate, define, and describe the leasable minerals in the Saline Valley Planning Unit for the Bureau of Land Management's Mojave Desert Study.

The Saline Valley Planning Unit (Figure 1) is located about 113 km (70 mi) southeast of Bishop, California, and about 24 km (15 mi) east of Lone Pine, California. The western boundary of the planning unit is the crest of the Inyo Range, and the eastern boundary is Death Valley National Monument. Access is by rough, secondary dirt roads that enter Saline Valley from the north and south. Both roads may be closed for short periods in the winter due to snow. The area of concern for this report is Saline Valley where leasable commodities of sodium and geothermal resources have been indentified. No leasable commodities have been identified in the surrounding mountains within the planning unit boundary.

GEOLOGIC SETTING

Saline Valley is located in the Basin and Range physiographic province. A playa has formed in the central and lowest portion of the valley. The lowest point in the valley is slightly over 305 m (1,000 ft) in elevation. The crest of the Inyo Range to the immediate west is over 3353 m (11,000 ft) in elevation. Most peaks in the Panamint Range to the east of Saline Valley are less than 2438 m (8,000 ft) in elevation.

Structure

Saline Valley is a graben associated with basin and range regional extension. The valley is bounded on the west by a north to northwest trending normal fault with over 3048 m (10,000 ft) of vertical displacement and an unknown amount of right-lateral displacement (Lombardi, 1963). The east side of the valley is bounded by a series of north- to northwest-trending en-echelon normal faults. Lombardi (1963) has also mapped several faults near the center of the valley. These faults strike in a northwest to westerly direction, with both right-lateral and normal displacement. Lombardi lists several occurrences of fresh fault scarps substantiating recent movement along some of these faults. The floor of the valley has been tilted to the southwest as indicated by the restricted area of Salt Lake in the southwest corner of the valley. This lake once occupied the center of the valley, formed a playa, and is now restricted to an area of less than 2.59 km^2 (1mi^2). Brines are on the surface of the playa in its southwest corner, but are 1 to 1.5 m (3-5 ft) below the surface elsewhere on the playa. This data also suggests that Saline Valley has been tilted.

Rock types

Saline Valley is surrounded by a wide variety of rock types. The rocks to the west in the Inyo Range are Paleozoic marine deposits and their metamorphic equivalents. These rocks are intruded by Mesozoic granitic rocks, primarily quartz monzonites. Considerable alteration and metasomatism has occurred along the contacts between these two rock types. Numerous mines are scattered along the contact zones. The rocks to the north in the Saline Range are Tertiary basalts and trachyandesites. In several areas these have been extruded onto valley alluvium. The source area for these volcanics may be the heating source of the several hot springs located in the northeast corner of Saline Valley. The rocks to the south and east are a mixture of Mesozoic granitic rocks and Paleozoic marine rocks and their metamorphic equivalents. Alteration and mineralization are present in places in these rocks as they are in the Inyo Range to the west.

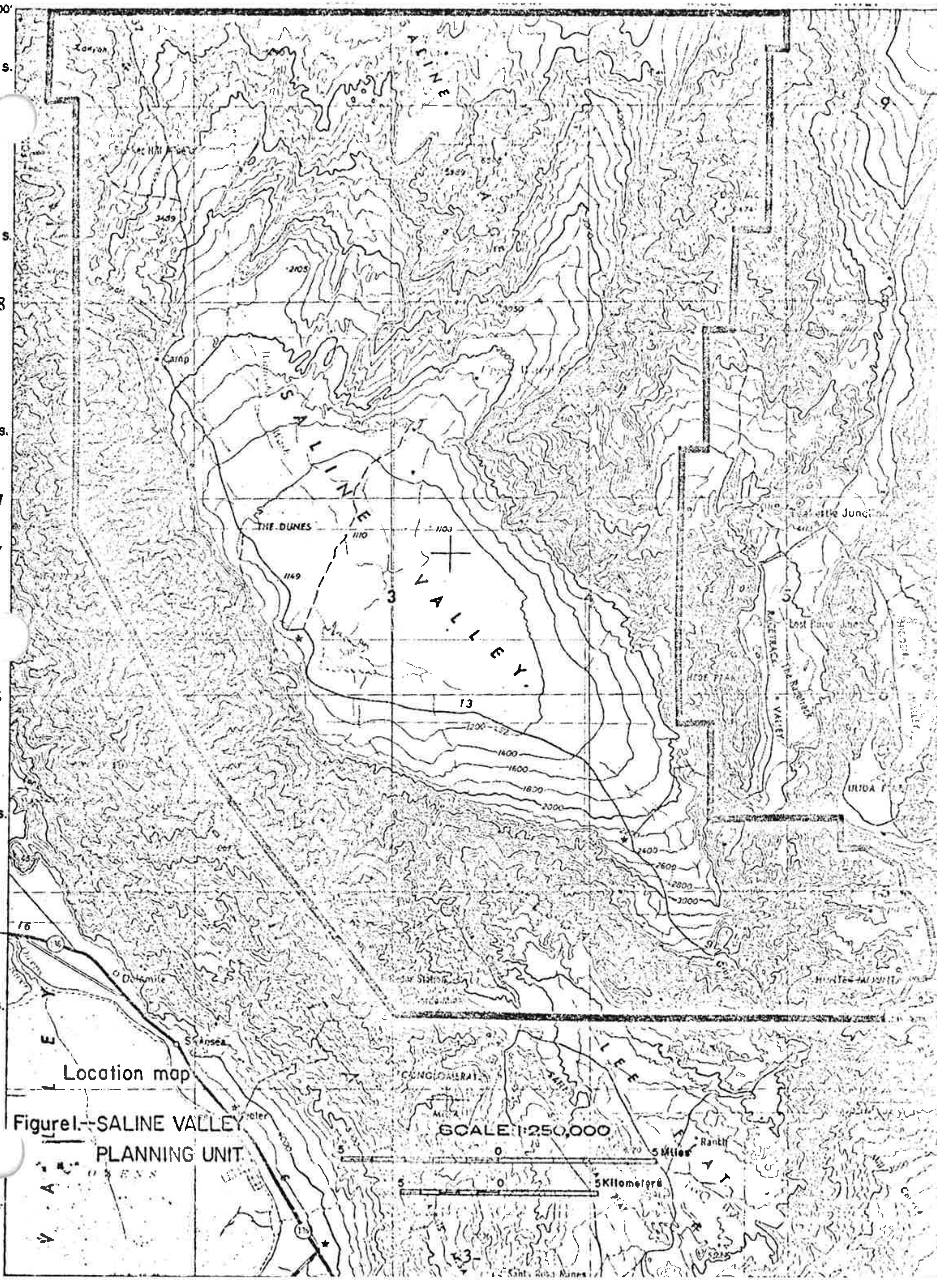

Figure1.--SALINE VALLEY PLANNING UNIT

Saline Valley is filled by coalescing alluvial fans along its margins. The central part of the playa contains fine-grained lacustrine deposits grading into coarser grained sands and gravels toward the margins of the valley. The gravels to the north are composed principally of volcanic clasts. The sands and gravels of the other parts of the valley are predominantly granitic fragments.

The lacustrine deposits of Saline Valley are primarily fine-grained quartz, feldspar, calcite, and clay. In the central and southwest corner of the valley considerable salt and alkali efflorescences are present. In the areas of the three drill holes, carbonate muds and various salts constitute 90% of the surface deposits.

Travertine and related hot spring deposits are common in the northeast corner of Saline Valley in the vicinity of several active and extinct hot springs. A large mound of travertine is located along the east portion of the valley and marks the site of a former hot spring area. All of the hot springs and hot spring deposits are associated with nearby faults and reflect deep circulation of near-surface groundwater.

Salt deposits occupy an area of more than 41 square km (16 square mi) in the central and southwest portion of Saline Valley. The surface salts are primarily sodium chloride as well as sodium and calcium sulfates. Surface deposits of halite and other salts vary from an efflorescence to a layer as much as 1 m (3 ft) thick. Ulexite was once harvested from these surface efflorescences. A near saturated or saturated brine with respect to NaCl and/or $NaSO_4$ occupies about 31 square km (12 square mi) of the playa and occurs at a depth of less than 4.6 m (15 ft) in all areas within this zone (Figure 2).

Geothermal resources

Hot springs are located in a tributary valley that joins northeastern Saline Valley with Eureka Valley. The hot springs appear to be rising through the valley alluvium from buried fault zones. There are four sets of hot springs in this tributary valley, and several extinct hot springs with deposits of travertine. A warm-water artesian well near the Inyo Range frontal fault is located immediately east of Salt Lake, and a small warm water flow was encountered from drill hole SV-2.

A large travertine deposit is located on the alluvial slope northeast of Salt Lake in Section 14, T. 14 S., R. 39 E. No springs are currently associated with the travertine.

An analysis of the thermal springs in Saline Valley was completed by R.H. Mariner, U.S. Geological Survey, during February 1977. A summary of his results as it pertains to estimated subsurface temperatures are listed below: (R.H. Mariner, oral commun., June 1977).

TABLE 1.--Analysis of thermal springs, Saline Valley, Inyo County, California

Location	Surface Temperature	Calculated Subsurface Temperature	Chemical Method
Artesian well (NW¼, sec. 27, T. 14 S., R. 39 E.)	23°C	69.5°C	Na-K-Ca (B=4/3)
		78.0°C	Chalcedony
Drill hole SV-2 (SE¼, sec. 22, T. 14 S., R. 39 E.)	22°C	80.0°C	Quartz (conductive)
Upper Warm Springs (N½N½, sec. 9, T. 13 S., R. 39 E.)	50°C	96.0°C	Quartz (conductive)
		65.4°C	Chalcedony
		171.5°C	Na-K-Ca (B=1/3)
		106.2°C	Na-K-Ca (B=4/3)
Palm Spring (NE¼ sec. 18, T. 13 S., R. 39 E.)	50°C	95.9°C	Quartz (conductive)
		65.2°C	Chalcedony
		171.7°C	Na-K-Ca (B=4/3)
		107.0°C	Na-K-Ca (B=4/3)
Lower Warm Spring (SE¼, sec. 18, T. 13 S., R. 39 E.)	43.5°C	Same as Palm Spring	

The artesian well and the artesian flow from drill hole SV-2 represent a warm-water flow from the same source. This flow is the result of circulation by near surface waters along the frontal fault zone that parallels the east face of the Inyo Mountains. The water is warmed at depth and then returned to the surface. The geothermal potential for this water is minimal. It could be used by future salt operations where a moderate volume of warm water is required.

The hot springs located in and near the Saline Valley Known Geothermal Resources Area probably originate by meteoric water circulating to depth and being warmed by remnant heat from the deep seated magmatic source that supplied the Saline Range extrusive rocks. This water is returned to the surface through fault zones that probably exist below the valley alluvium. The subsurface temperatures for these hot springs probably do not exceed 100°C. With such a low temperature, the uses for the geothermal resource are somewhat restricted. Space heating, hot spas, and use by future salt operations in the valley are the most likely possibilities.

SODIUM AND POTASSIUM

History of mining and development

One of the earliest recorded reports on Saline Valley was written by Bailey in 1902. He states (p. 118) that "Extensive deposits of pure rock salt were discovered in 1864 ... Salt springs, borax beds and salt beds are numerous and extensive; but lack of transportation facilities has prohibited nearly all development." The Conn and Trudo Borax Co., in 1902, had claimed several hundred acres on the playa and had small workings for handling the borax. According to Bailey (1902, p. 49) "The crust containing borax on the company's land is from 6 inches to 2 feet thick, and in some spots carries as high as 90 per cent of borax." Borax mining in the valley terminated in 1907. Gayle (1912, p. 421) concluded that the surface borate deposits had been exhausted.

Gayle (1912) visited Saline Valley and reported that the salt crust occupied about 31 square km (12 square mi) of the valley floor. At that time an aerial tramway was under construction from Swansea at Owens Lake over the Inyo Mountains and down to the edge of the salt marsh in Saline Valley. Salt was being harvested by raking the crystals of NaCl into stacks for drying, then shipping the salt to Swansea via the tramway.

Gayle (1912, p. 420) sampled surface and near surface brines in several localities, and analyzed the dried residues for potassium. His table of values is shown in Table 2.

TABLE 2.--Potash Analyses of Brines from Saline Valley, Inyo County, California

No.	% Total Salts	%K	$\%K_2O$	%KCl
1[a]	29.77	1.29	1.56	2.47
2[b]	28.10	.78	.94	1.48
3	28.05	.81	.99	1.55
4[c]	28.77	1.29	1.56	2.47
5[d]	28.26	.95	1.15	1.82

[a] From approximately one mile north-northeast of the northeast corner of Salt Lake.
[b] 2 and 3 from the north margin of Salt Lake.
[c] From the southwest margin of Salt Lake.
[d] From the southeast margin of Salt Lake.

Mining of the salt continued intermittantly from 1911 through 1930. The tramway was overhauled in 1929, and at the cessation of operations in 1930, about 30,000 tons of NaCl had been shipped over the tramway.

Some work was done in 1954 towards producing more salt, and some halite was stockpiled for shipment. During the course of operations a 4 foot layer of thenardite (Na_2SO_4) was found to underlie the ooze in the central part of the small Salt Lake. The lateral extent of this layer is unknown (Ver Planck, 1958, p. 25). An analysis of the near surface brine underlying Salt Lake is shown in table 3. No mining of salts has been attempted in Saline Valley since 1954.

Surface deposits

Lombardi (1963) and Hardie (1968) conducted fairly detailed examinations of the playa surface and analyzed its surface and near surface brine. Lombardi concentrated on trace element distribution and Hardie concentrated on the mineralogy and major element geochemistry of the brine. Lombardi concluded that there were several centers of evaporation for the playa, with considerable variation of the trace element from one center to another. Major elements showed minor variations. All of the surface brines examined by Lombardi were dominated by sodium, chloride, and sulfate ions; potassium ion is usually present at less than 3%. Table 4 shows the percent composition of the surface muds and Figure 3 shows sample locations. Lombardi (1963) (Figure 2) also determined the salinity of the brine at his different sample locations.

TABLE 3.--Brine Analyses from Salt Lake
Saline Valley, Inyo County, California

	Percent of Dissolved Solids						
	Na	K	Ca	Cl	B	CO_3	SO_4
1[a]	36.4	1.2	.05	48.6	Tr.	---	12.1
2[b]	34	1.5	.01	51	---	---	---
3	36	1.0	.1	55	---	---	7.0
4	36	2.5	.3	52	---	---	8.0
5	36.7	1.2	.09	51.5	1.6	.21	5.5

[a]Recalculated from King, C.R., 1948, p. 190, table 1.
[b]2 through 5 from Lombardi, (1963, table 1).

TABLE 4.--Percent Composition of Muds from
Saline Valley, Inyo County, California[a]

Sample No.	Location[b]	K	Mg	Ca	$CaSO_4$	(Mg, Ca)	Brine
1	7	2	3	3	1	20	30
2	19	.2	1	10	20	20	40
3	20	2	3	3	2	10	20
4	21	2	3	3	2	20	30
5	22	2	3	3	1	20	20
6	23	2	3	3	1	15	20
7	25	2	3	3	1	20	20
8	28	2	10	10	-	40	50

[a]From Lombardi (1963, table 2).
[b]Refer to figure 3.

Surface areas of abnormally high concentration are credited by Lombardi (1963), to evaporation. The surface brine of highest concentration ($\gtrsim$ 20% salinity) forms an east-west configuration with a bulge to the northwest at the northwestern corner of the playa (figure 4). All of the high salinity brine occurs within the 1080 foot contour line. Lombardi (1963) reports that the brines are predominantly sodium chloride with the exception of the northwest corner of the playa where sodium sulfate is the dominant constituent.

Sodium borate, which is concentrated in the surface efflorescences, is slightly more abundant in the northeastern and north central parts of the playa. In brine residues sodium borate did not exceed one percent and would be proportionately lower in concentration in the brine itself.

In his examination of the surface and near surface deposits in Saline Valley, Hardie (1968), defined three areas of evaporation with somewhat different precipitation assemblages (Figure 2). These are:

1. A $NaSO_4$- rich brine with thenardite precipitated in the northwest corner of the playa.
2. A NaCl- rich brine with halite precipitated in the southwest corner of the playa (the present salt lake).
3. A Ca- deficient, sulfate-rich brine with higher B_2O_3 values in the northeastern to north central part of the playa.

A possible explanation for these variances can be attributed to their source areas. The $NaSO_4$- rich area lies downslope from highly mineralized areas in the Inyo Mountains. An enrichment in sulfate can be expected from the weathering of these deposits. The Ca-deficient area is downstream from the hot springs in the northeast portion of the valley. Most of the Ca has been deposited around these springs as tufa and travertine ($CaCO_3$). The NaCl-rich area in Salt Lake is the result of the closed drainage in the lower part of the Saline Valley. Rains and flash floods dissolve the highly soluble NaCl from the surface efflorescences and carry the salt in solution to Salt Lake where it is reprecipitated by evaporation.

Subsurface deposits

Three holes were drilled on the edge of Salt Lake in Saline Valley (Figure 5). One hole was partially cored with a 2 5/8 inch interior diameter 10 ft core barrel. Two holes were drilled adjacent to the first tramway tower on the south side of the lake (Figure 2). The first hole, SV-1, was drilled as a test hole to give the driller experience in soft, water-saturated sediment drilling, and to determine if there were any salt layers at depth. The second hole, SV-1A, was drilled 8 m (32 ft) to the north. Four 3 m (10 ft) intervals were cored

in SV-1A. The first core run was to test the core barrel; the next three core runs sampled the more favorable appearing salt sequences penetrated in hole SV-1. The third hole, SV-2, was drilled on the western edge of Salt Lake, approximately 100 m (330 ft) west of the lake margin, and about 43 m (140 ft) west of the surface efflorescence. SV-2 did not encounter significant amounts of salt, probably because of the relatively rapid increase of surface elevation west from the lake and because the hole was 40 m (120 ft) west of the surface efflorescences.

Resistant layers were logged by drilling rate in SV-1 and SV-2 and grab samples were taken from the circulating mud column every 1.5 to 2 m (5 to 7 ft). All hard layers below 20 m (65 ft) were salt. The close proximity of holes SV-1 and SV-1A allowed good correlation of the resistant layers. The four core runs in SV-1A gave added confidence and accuracy to the driller's logs.

Resistance, self-potential, and gamma ray logs were run in holes SV-1A and SV-2. A caliper survey was also run, and proved of value in locating a zone of artesian flow in SV-2. The electrical logs gave good results in locating salt layers, and an idea of each bed's thickness.

The gamma ray log gave supporting data for where salt layers occurred, but did not indicate how thick the layers were, as potassium concentrations did not necessarily reflect the thickness of salt. Some of the mud and salt horizons gave high gamma readings, while some of the thick salt horizons gave low readings.

The drilling fluid was obtained by drawing brine from five 4.6 m (15-ft) deep, 12.7 cm (5 in) diameter holes drilled adjacent to the lake. This fluid proved to be about 30 percent saturated with salts, and was considerably more dilute than expected. This proved an aid for the electrical logs, which may not have been as effective with a saturated brine. The unsaturated brine did prove to be a slight problem in that it tended to dissolve the salts somewhat before they reached the surface. This was especially true in the case of the highly soluble halite, and tended to give an erroneously low impression of the amount of halite with respect to the less soluble thernardite in the salt layers at depth. This error factor increased with depth as the halite had more chance to dissolve before grab samples could be obtained. The dilute drilling brine also caused considerable erosion of the cored salt layers, and several of the core fragments were less than 5 cm (2 in) in diameter instead of the 6.35 cm (2½ in) core diameter normally obtained.

All grab samples and cores were logged in the field using a hand lens. They were relogged in the laboratory using a binocular microscope. One hundred twenty samples of crystal grains, mud layers, and salt horizons were X-rayed by powder diffraction methods to determine the mineralogy and a rough approximation of the amount of salts present in the various layers cored. The graphic logs are shown in Figure 8.

LOGS OF HOLES SV-1, SV-1A, AND SV-2

Drill hole SV-1

Depth (feet)	Unit Thickness (feet)	Description
10	10	Fine- to coarse-grained sand, silt, light gray to slightly brownish mud, traces of halite crystals less than 1 mm in diameter.
30	20	Very fine-grained sand to silt. Calcite cleavages. Halite fragments present. The section is about 5 percent gypsum crystals and crystal aggregates to 1 cm in size.
45	15	Angular to subrounded, fine-granule (2-4 mm) gravel, feldspar fragments, fine grained sand is dominant with abundant gypsum and calcite fragments. Carbonized wood fragments and small seed pods present.
50	5	Gypsum dominant in compact masses of small crystals. Not the abundance of well formed crystals seen earlier. Consists of calcite up to 30 percent of the total.
60	10	Coarser gravels, clasts up to 1 cm in diameter. Fragments of limonite present. Gypsum abundant. Primarily a gypsum and calcite sand. Some halite and thenardite present.
62	2	Gray color to mud. Abundant thenardite. Some coarse sand and gravel.
90	28	Abundant thenardite. Gypsum very common and altering to mirabilite. A mushy, white, fine grained mixture of mirabilite and thenardite is cementing much of the material together. Gravel makes up about 40 percent of the interval. Wood chips and seed hulls are cemented to the gravels. A single 3 mm fragment of fresh pyrite was identified. Some colorless, transparent octahedra of halite are present.

Logs of Holes SV-1, SV-1A, and SV-2 (continued)

SV-1 (continued)

Depth (feet)	Unit Thickness (feet)	Description
109	19	Scattered salt layers. Fine sand and mud horizons. A few gravel concentrations.
110	1	Salt layer. Halite present in octahedrons up to 1 cm in length.
120	10	Mud impregnated with fine- to coarse-grained gravel and salt. Both halite and thenardite present.
127	7	Interlayered mud and salt. H_2S smell present.
128	1	Salt layer, halite and thenardite.
130	2	Mud. Mud now black and strong H_2S odor.
132	2	Salt layer. Halite and thenardite. Halite in octahedrons to 2 cm. Thenardite is in long bladed crystals. The salt layer is vuggy.
134	2	Black mud. Scattered salt crystals.
135	1	Salt layer.
137	2	Black mud. The muds are still dominantly carbonate.
138	1	Salt layer. Large thenardite fragments. Gypsum altered to mirabilite is present.
140	2	Black mud.
145	5	Repeated salt-mud layers stacked one on top of another. Gypsum altering to mirabilite is present. Halite and thenardite are dominant.
152	7	Black mud.
153	1	Salt layer.
154	1	Black mud.
155	1	Salt layer.
156	1	Salt and black mud intermixed.
162	4	Black, greasy, clay-like mud. H_2S and a petroliferous odor are present.
163	1	Salt layer with some intermixed black mud. A dense aggregate of salt crystals with mud forming the matrix.

Logs of Holes SV-1, SV-1A, and SV-2 (continued)

SV-1 (continued)

Depth (feet)	Unit Thickness (feet)	Description
168	5	Black mud.
172	3	Black mud.
184	12	Thick salt layers with thin interbedded mud layers. About 10 percent of the salts are composed of small gypsum aggregates altering to mirabilite.
190	6	Black mud. Scattered salt fragments.
201	11	Interbedded salt layers separated by thin mud layers.
207	6	Black mud. Some salt intermixed.
207.5	.5	Thenardite layer.
211	3.5	Black mud.
230	19	Repeated salt layers. Thenardite and halite are present. Thenardite is in euhedral crystals to 2.5 cm.
240	10	Black mud and salts intermixed.
270 (T.D.)	30	Gray, fairly dry, stiff clay. Strong NH_3 odor when freshly broken open.

Logs of Holes SV-1, SV-1A, and SV-2 (continued)

SV-1A

Depth (feet)	Unit Thickness (feet)	Description
20	20	Fine- to coarse-grained sand, silt and gray to brown mud. Abundant small gypsum crystals and rosettes. One thin gravel layer encountered at about 18 feet.
30	10	Mud and silt. Scattered halite crystals. Small gypsum crystals common.
50	20	Mud, silt, and sand. Scattered thin layers of gravel 2-4 mm diameter.
61	11	Several thin salt layers. Mud and silt predominate.
64	3	Mixed sand, gravel, and salt layers. Gypsum rosettes altering to mirabilite. Two salt layers present with about 18 inches of black mud between. The top layer is primarily thenardite. The bottom layer is a mixture of thenardite and halite, with the halite content higher in the middle of the bed and grading towards thenardite at the top and bottom.
65	1	Salt layer. Thenardite present.
75	10	Interbedded salt and black mud layers.
82	7	Interbedded salt and mud layers. Four salt layers from 1-3 inches thick were encountered from 1-2 feet apart. Black mud lies between the salt horizons.
90	8	Mostly black mud. Three thin salt layers present.
92	2	Several thin salt layers present.
105	13	Black mud. Some salt in mud present from 100-103 feet.
110	5	Black mud.

Logs of Holes SV-1, SV-1A, and SV-2 (continued)

SV-1A (continued)

Depth (feet)	Unit Thickness (feet)	Description
112	2	Several thin salt layers with interbedded black mud.
120	8	Black mud.
121	1	Salt layer.
128	7	Black mud.
133	5	Primarily salt layers, close together with thin seams of gray mud between layers. Salts are dominantly halite with some thenardite. A zone of sand lenses occurs at 129 feet. Thenardite is the major salt in the thicker mud seams, halite is always present. Both minerals tend to form euhedral crystals in the mud with thenardite forming large crystals to 3 cm in length.
135	2	Black mud. Halite and thenardite present in scattered crystals.
140	5	Black mud.
143	3	Two thin salt layers. The rest is black mud.
151	8	Black mud. A zone of salt crystals in the mud occurs at 146 feet.
162	9	Primarily black mud. Thin salt layers occur at 152 and 154 feet.
163	1	Salt layer. Halite and thenardite.
168	5	Black mud.
171	3	Black mud and salt.
179	8	Nearly continuous salt. Salt layers with thin mud seams. The salt layers grade back and forth from sulfate rich to chloride rich repeatedly through the section. Halite commonly forms the middle of each salt layer and grades to thenardite towards the top and/or bottom of the individual layer.

SV-1A (continued)

Depth (feet)	Unit Thickness (feet)	Description
183	4	Salt-rich mud. Large euhedral halite and thenardite crystals. Abundant gypsum nearly completely altered to mirabilite.
189	6	Black mud.
190	1	Salt layer.
192	2	Black mud.
194	2	Two thin salt layers with black mud betwen layers.
197	3	Closely spaced salt layers.
207	10	Black mud. A thin salt layer is present at 200 feet.
208	1	Salt layer.
210	2	Black mud.
214	4	Several thin salt layers with interbedded black mud.
215	1	Salt layer. Predominantly thenardite.
220	5	Black mud.
222	2	Mud plus salt. Abundant gypsum altering to mirabilite.
224	2	Salt layer. Predominantly yellowish thenardite.
226	2	Thin salt layers with interbedded black mud. The black mud is marbled in a random manner with gray mud. An ammonia smell is associated with the gray mud when it is freshly broken.
230	4	Black and gray marbled mud. Thin black mud horizons.
231	1	Salt layer about 6 inches thick between 230-231 ft.
240	9	Black mud with several thin salt layers.

Logs of Holes SV-1, SV-1A, and SV-2 (continued)

SV-1A (continued)

Depth (feet)	Unit Thickness (feet)	Description
255	15	Several 1-6 inch salt layers with interbedded black muds.
273	18	Black mud. Entered gray mud at 273 ft.
315 (T.D.)	42	Gray, stiff, fairly dry clay. Gray clay is considerably warmer than black clay as drilling fluid warmed over 10°F. in the 45 minutes of drilling from 273 to 315 feet.

Logs of Holes SV-1; SV-1A, and SV-2 (continued)

SV-2

Depth (feet)	Unit Thickness (feet)	Description
12	12	Sand and silt. Thin gravel layers.
14	2	Gravel lenses with euhedral salt crystals.
21	7	Brown mud, silt.
22	1	Salt layer.
30	8	Mud and silt.
35	5	Coarse-grained gravel. Cobbles to 5 cm. Euhedral thernardite crystals intermixed.
48	13	Black mud.
50	2	Several thin salt layers.
54	4	Sand and gravel layers with black mud and cobble mixture between layers. Aquifer encountered here.
75	21	Black mud.
88	13	Black mud marbled with gray.
92	4	Several thin salt layers.
102	10	Black mud.
131	31	Gray mud.
135	4	Two thin salt layers interlayered with black mud and gray mud.
182	47	Gray mud.
185 (T.D.)	47	Extremely coarse-grained gravel grading downward into boulders. Possible alluvial fan surface.

MINERALOGY

The black and gray muds encountered in the three drill holes are composed predominantly of authigenic carbonate. X-ray diffraction analyses of many mud horizons shows that the muds are dominantly calcite with lesser dolomite and traces of clay, quartz, and other rock-forming minerals. The authigenic minerals (Table 5) identified in the three drill holes are calcite, dolomite, gypsum, mirabilite, thenardite, and halite. No glauberite was identified, although it was identified as a common mineral present at the surface (Hardie 1968).

All of the black muds examined are fairly wet and saturated with a salt-rich brine. However, none of the mud in the cores was sufficiently wet with brine to allow any leakage of brine from the cores. No brine layers were encountered in any of the holes below approximately 18 m (60 ft) and it is not certain if any free brine exists below about 9 m (30 ft). Most of the salt layers encountered in the cores were dry and compact. Capillary water is present in the salts. Vuggy layers had no provable free brine present. Permeability in the salts varies from very little in the solid layers to moderate in the vuggy layers. The mud has a very low permeability. Porosity is very low in the muds and the compact salt layers, but is high in vuggy salt layers.

The salt layers varied from nearly pure halite (NaCl) to nearly pure thenardite (Na_2SO_4). A common sequence in individual beds is to have thenardite forming the bottom and grade upwards into halite. Single layers of nearly pure halite or nearly pure thenardite are also common. Some beds appear to grade back into thenardite near the top of the bed. Salt layers are separated by mud layers which vary from thick layers of black mud to very thin seams (1 mm thick) of gray carbonate mud. Many layers do not show discernible boundaries between one another and make up continuous series of thenardite-halite rich concentrations stacked many times one upon the other. In the sections cored by SV-1A no single salt layer exceeded 15 cm (6 in) in thickness. Aggregates of salt layers several feet thick occurred in both holes SV-1 and SV-1A.

Gypsum is present in large quantities as small clean crystals in the upper portions of the drill holes. In the lower portions of holes SV-1 and SV-1A, gypsum is present in some zones in considerable quantity, but in other zones it makes up less than one percent of the total solids or is missing. In the lower portions of both drill holes, the gypsum is being altered to a white pasty mixture of calcite and mirabilite, with the mirabilite the dominant mineral. The change from unaltered to altered gypsum occurs at depths between 15 and 23 m (50 and 75 ft). The degree of alteration increases with depth.

TABLE 5.--Authigenic Minerals from Saline Valley

Name	Formula
Calcite	$CaCO_3$
Dolomite	$CaMg(CO_3)_2$
Gypsum	$CaSO_4 \cdot 2H_2O$
Mirabilite	$Na_2SO_4 \cdot 10H_2O$
Thenardite	Na_2SO_4
Halite	$NaCl$

Depositional environments

The gray clays represent periods of brackish or salt water accumulations. Calcite and dolomite make up 99 percent of this mud; calcite is the predominant mineral. The lack of any other clastic mineral suggests that the gray carbonate clay is authigenic and precipitated in a shallow lake basin under oxidizing conditions. The lake basin was apparently stable with little freshwater inflow. The black muds turn gray when exposed to the atmosphere for a short period of time. When washed free of salts, they are predominantly carbonate muds and give essentially identical X-ray patterns to the gray clay. The black muds represent periods of evaporation in a stagnant basin under reducing conditions. Most of the black muds examined have small to large salt crystals embedded in them. The muds that do not contain visible salt crystals usually give small peaks during diffraction analysis for halite and (or) thenardite. All samples of black mud that were dried gave halite peaks when X-rayed; most also gave thenardite peaks. This indicates that the wet portion of the mud is a salt-bearing liquid. The black mud has an H_2S and petroliferous odor that persists for some time. The salt layers represent periods of dryness or near-dryness of the lake. During an evaporation cycle, thenardite (or mirabilite, $Na_2SO_4(H_2O)_{10}$) crystalizes first, followed by halite. When this cycle is interrupted by brief inflows of fresher water, and if some halite has been precipitated, the halite could be expected to redisolve, whereas the less soluble thenardite might remain as the only salt.

Hardie (1968) has proposed a series of facies changes for the Saline Valley surface salt deposits. These changes grade from the margins of the playa inward in the following sequence:

$$CaCO_3 \quad CaSO_4 \quad CaNaSO_4 \quad NaSO_4 - NaCl.$$

The calcite deposition would occur in the alluvial fan, the gypsum in the near shore environment and the salts in the evaporating playa. The drilling results support this facies concept with a few changes. The first is that the $CaCO_3$ mud appears to be authigenic, and is nearly completely free of clastics. It did not form in an alluvial fan environment, and is different from any ongoing phenomenon in the basin today. The second is that no glauberite ($NaCaSO_4$) was encountered. The variances from salt beds to gypsum muds to salt muds at depth reflect changes in the depositional cycle of the lake. The gypsum muds accumulated when the salt evaporation center was further lakeward. The salt muds and solid salts represent dessication after periods of large water accumulations during a higher lake level than now present.

The gypsum encountered in the drill holes probably formed according to Hardie's concept. Tilting of the basin has allowed the brines to permeate the gypsum zones. Because these brines are not in equilibrium with the gypsum, alteration of the gypsum is taking place. The near-surface gypsum deposits have not had sufficient time to be replaced by sodium. The deeper gypsum deposits have had more time to react. Conditions at depth may also be somewhat more favorable for replacing the gypsum with the resultant mirabilite + calcite assemblage.

Economic potential

The surface deposits of the playa's evaporating pan are of sufficient thickness to warrant the present classification as "valuable for sodium." The present classification does not include the eastern portion of the playa within the 1080 ft contour line. These lands also will be classified as valuable for sodium, as both the brine and the salt crust are of sufficient concentration and thickness to warrant this classification.

Holes SV-1 and SV-1A penetrated numerous halite and thenardite zones and beds. Three zones of salt were of sufficient thickness and purity to be classified. These are the horizons from 18-24 m (60-80 ft) 39-40 m (128-132 ft), and 52-56 m (170-185 ft). Hole SV-2 did not penetrate any salt of sufficient quality to warrent classification as valuable for sodium. Several thin salt layers were cut and these can be expected to thicken to the north-east.

The abundance and number of salt horizons encountered in holes SV-1 and SV-1A, which are on the extreme south edge of the playa, make it obvious that considerable salt exists in Saline Valley. The presence of abundant thenardite, often in nearly pure beds, make this area a likely target for sodium sulfate extraction. The sequences of salt on the very edge of the playa can be expected to thicken considerably towards the center of the playa. How the mineralogy of the salt layers will change in the subsurface north, northeast, and east is difficult to state without further drilling. The surface presence of a 1.2 m (4 ft) bed of thenardite about 1 km north of the SV-1 and SV-1A drill sites, as well as the conclusions reached by Lombardi (1963) and Hardie (1968) in their studies of the present playa surface, suggest that considerable quantities of $NaSO_4$ may exist to the north. Halite and possible potassium and borate salts may increase to the northeast and east and may increase in concentration relative to the Na_2SO_4.

As a result of the surface examination and drilling information obtained for this report, the playa within the boundaries shown on Figure 5 will be considered valuable for sodium. Although the previous valuable for sodium boundaries did not reflect this information, they are being changed.

The majority of the valley is currently classified as prospectively valuable for sodium. As a result of this investigation, some of these lands are being reclassified.

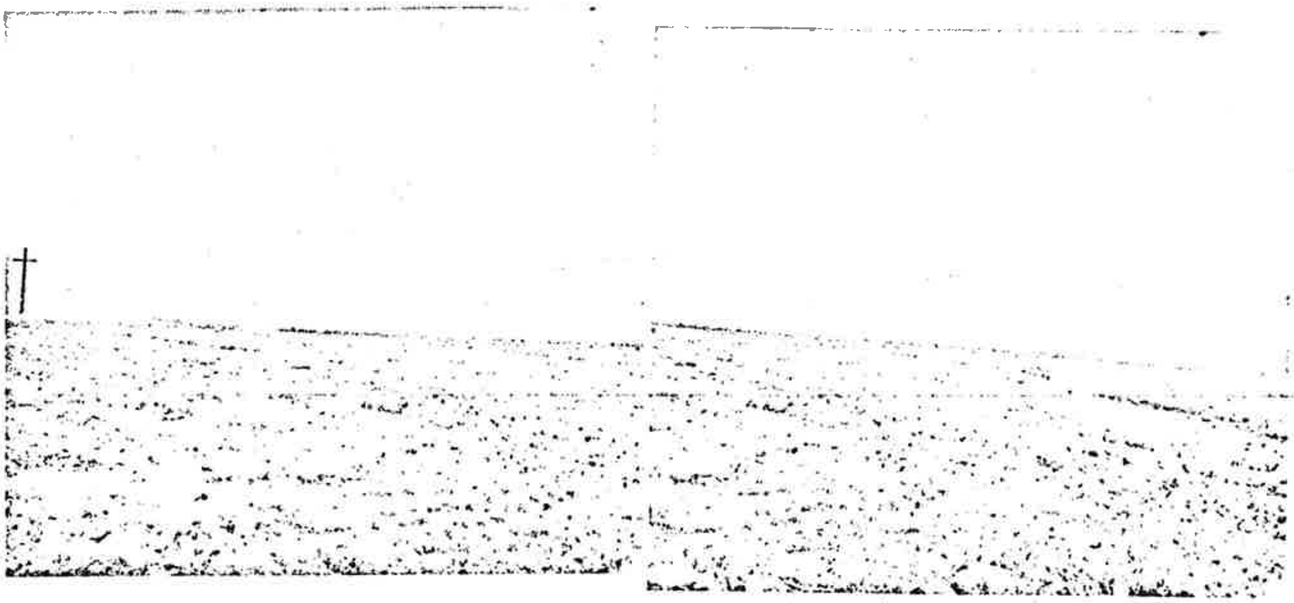

Figure 6.--Partial stereo view from drill hole SV-1A looking north-northeast across Salt Lake towards Lower Warm Springs.

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APPENDIX VI

DPS FIELD NOTES

NOTEBOOK I

RECORDER: C. SABINE

INDEX BOOK 1

83-85	MINES & PROSPECTS S & SE OF KEYNOT MINE
86-88	BEVERIDGE CYN
89-91	TREPIER MINE

①

7/6/76

LV RIVERSIDE 1000 HRS

ARR. BISHOP RAH 1500 HRS SPORTSMAN MOTEL

DOUG McFARLAND NOT IN OFFICE

7/7/76

0800 DOUG McFARLAND HOME SICK
SET OFF DYNAMITE DAY BEFORE,
STARTED FIRE - CAUSED SUNBURN
TO BLISTER BADLY FIGHTING FIRE.

ROAD LOG TO SALINE VALLEY
FROM BIG PINE (14 MI S. OF
BISHOP)

16641.6	JCT 395 + 168 AT N EDGE OF BIG PINE EAST ON 168 TOWARD WESTGARD PASS
43.8	TAKE RT FORK SE (WAUCOBA RD) SIGN TO SALINE VALLEY, WAUCOBA 34 SIGN BRISTLECONE COPPER CO 25 MI
52.8	SIDE RD S TO HARKLESS FLAT SEC S 26 9S 35E WAUCOBA MTN QUAD
56.7	GREEN SIGN DEATH VALLEY VISITOR CENTER 114 ↑ SALINE VALLEY → TAKE DIRT RD SE S 32 9S 36E

(2)

57.7	FORK. STAY LEFT. RT FORK CIRCLES AROUND & REJOINS RD ~.1 MI ~~[illegible]~~ EAST.
58.1	SWITCH BACKS
58.5	FLOOR OF COWHORN VALLEY
62.8	SWITCH BACKS
63.35	MARBLE CNYN. ~~RD~~ JEEP RD ~~S~~ TO OPAL MINE & WHIPOORWHILL FLAT. CONT EAST DOWN CNYN
63.5	SIGN LEAVING INYO NATL FOREST LINE OF 14 SHAFTS IN FLOOR OF MARBLE CANYON EXTENDING EASTWARD FOR TWO MILES DOWN CNYN. OUTCROPS WYMAN FM N SIDE CNYN DK GRAY QTZITE & ARGILLITE
64.1	OLD CABIN PARTLY DESTROYED
64.5	SEVERAL SHAFTS & CABINS BOTTOM MARBLE CANYON. FORK TAKES RD S TO WHIPOORWHIL FLAT
66.1	RD WEST TO OPAL MINE N END WHIPOORWHILL FLAT.
67.7	TAKE SIDE RD. WEST
67.8	BLM TRAILER. NW¼ S3? 10S 37E PHOTO 5-704
68.0	RETURN WHIPOORWHILL FLAT RD CONT SOUTH
69.5	ENTER WHIPOORWHILL CANYON SECTION REED DOLOMITE, DEEP SPRING FM & CAMPITO FM

③

72.1	CANYON OPENS OUT INTO VALLEY 2 FERAL BURRO ~ ¼ MI EAST OF RD SW¼ S9 11S 37E
72.8	CROSS WAUCOBA WASH
76.3	RD DESCENDS TO SALINE VALLEY EXCELLENT OVERVIEW OF AREA TURN AROUND & RETURN NORTH

7/8/76

ONE HOUR DISCUSSION WITH MCFARLAND IN BISHOP OFFICE. BAKERSFIELD CUT HIM BACK TO ONLY THREE MONTHS FOR SALINE. NOT COMPLETELY CLEAR ON TYPE OF WORK THAT NEEDS TO BE DONE.

DRIVE WITH MC FARLAND TO CERRO GORDO VIA LONE PINE & KEELER CNYN. RETURN VIA LUCAS CNYN & LEE FLAT ROAD.

7/9/76

LV BISHOP 0900
ARR. RIVERSIDE 1430

(4)

7/12 – 7/[illegible] SEEKE

7/19/76 LV RIVERSIDE [illegible] WITH
[illegible] + TRAILER IN TOW
ARR. LONE PINE 1600 DOW VILLA
MOTEL.

7/20/76 MEETING IN LONE PINE WITH
DOUG McFARLAND + WARREN LONGWELL.
DISCUSSIONS + DEFINING TARGET AREAS.

7/21/76 MEETING IN BISHOP OFFICE WITH
McFARLAND, LONGWELL + AREA
MANAGER. EXPLAINED TIME NEEDED
TO DO JOB + NEED FOR MORE
MAN MONTHS FROM McFARLAND.

7/22/76 LV LONE PINE 0730. TAKE
TRAILER TO LUCAS CANYON +
PARKED AT SILVER SPEAR MINE.
DRIVE BARSTOW VIA RED ROCK
CNYN + RED MOUNTAIN.
ARR. BARSTOW 1700 HRS.
VAGABOND INN

7/23/76 LV BARSTOW 0730 TO HOLE IN
WALL. DESCRIBED FEATURES AT
HOLE IN WALL. LV H/W 1200. ARR
RIV. 1600

5)

7/26 – 7/30 OFFICE

8/2/76 LV RIV. 1115. ARR LONE PINE ≈1600. NIGHT IN DOW VILLA MOTEL LONE PINE

8/3/76 LV LONE PINE 0900 ARR TRAILER SAN LUCAS CNYN 1130. DAY SETTING UP TRAILER & CLEANING

8/4/76 PART OF DAY DRIVING AROUND FAMILIARIZING SELF WITH AREA. REST OF DAY READING MERRIAM PROF PAP 408

8/5/76
LOC. SILVER SPEAR MINE - CALLED ON TOPO
ELLA MINE BY MERRIAM. E. SIDE SAN LUCAS CNYN 1 MI N. OF CERRO GORDO
NEW YORK BUTTE QUAD UNSURVEYED
PHOTO 10-517 LOC 1
ADIT S50E ENTERS HILLSIDE IN
HIDDEN VALLEY DOLOMITE - THICK BEDDED (½-1 METRE) MICROCRYSTALLINE TO FINE GR (UP TO 1 mm) LIGHT TO DARK GRAY OCCASIONALLY LT BROWN
ADIT SEVERAL HUNDRED FEET LONG →

NOTE: INCORRECTLY NAMED SILVER SPEAR MINE ON NEW YORK BUTTE QUAD. SILVER SPEAR [illegible] IS [illegible] MINE

(6)

GOES THROUGH BARREN DOLOMITE
FIRST 30 METRES BEFORE ENCOUNTERING
VEIN AT FIRST WINZE.
VN S50E 60NE ~ 1m WIDE
FINE TO LOCALLY MED GR. MASSIVE
PORCELAINOUS MILKY QTZ
ZONE OF RED BROWN CELLULAR LIMONITE
ALONG FOOTWALL 5-10CM THK. &
SCATTERED THROUGH VN IN PODS 1-10 CM. DIAM.
THIN
BRIGHT RED BROWN COATINGS AND PARTINGS
MAY BE Pb OX. (?) SMALL MASSES OF
GALENA SCATTERED THROUGH VN MORE
CONC. NEAR FTWALL LOCALLY UP TO 10%
BUT GENERALLY ~ 1%. SMALL (<1cm) CLOTS
& STRINGERS CHRYSOCOLLA SCATTERED
THROUGH VN.
MERRIAM SAYS Cu STAIN DERIVED FROM
TETRAHEDRITE. SOME METALLIC XLS IN
THIN SEAMS (1mm) SEEN IN VN MAY
HAVE BEEN TETRAHEDRITE

ALTERATION –
SOME REXLLIZATION
OF DOLOMITE &
CALCITE STRINGERS
SLIGHT
SILICIFICATION
LOCALLY

POKING AROUND DUMP FOUND SAMPLES OF
GALENA IN QTZ; GALENA, TETRAHEDRITE (?)
CHRYSOCOLLA IN QTZ; BLADED & ACICULAR
CERUSSITE (?) ASSOC W CELLULAR FEOX;
GALENA ALTERED TO ANGLESITE (?).
ALSO FOUND THIN SMEARS OF CERARGYRITE ?
(RARE) + CUBIC PYRITE [illegible]
~ 1mm. RARE

(7)

SAMPLES: S-MINE GALENA FROM VN AT FIRST WINZE & ABOVE DESCRIBED MATRL FROM AROUND PORTAL

MERRIAM DESCRIBES VN AS QTZ-CALCITE-BARITE GANGUE, SAW SOME THIN (1-5mm) CALCITE STRINGERS IN DOLOMITE BUT CALCITE & BARITE NOT IDENTIFIED IN VN
MERRIAM GIVES DESCRIPTION + DIAGRAM OF ADIT WHICH SEEMS ACCURATE

MUCH OF VN REMAINS UNWORKED BUT PROBABLY TOO LOW GRADE TO BE ECONOMIC

PHOTO 10-517
LOC 2 ~ 30M SE OF #1 SHORT UPHILL FROM #1
ADIT ~ 8M LONG ON SAME VN AS #1
PROBABLY APPROX ABOVE FIRST WINZE
VN - W LT GRAY HIDDEN VALLEY DOL
~ 1M THK PINCHING DOWN TO ~10CM
MILKY QTZ W SCATTERED SPECS GALENA.
WHERE IT NECKS DOWN AT BACK OF ADIT
YELLOW-BROWN SMEARED N STREAKS OF

→

(8)

CHRYSOCOLLA

VN S50E 70NE

PROB ORIGINAL DISCOVERY

DOLOMITE CUT BY NUMEROUS 1-5MM

WHITE CALCITE VNLTS + SLIGHTLY SILICIFIED

NEAR VN

LOC 3 PHOTO 10-517

ABT 60 M DUE S OF LOC 2.

SHAFT INCL. 75° S75E ~10M DEEP

IN LT GRAY HIDDEN VALLEY DOLOMITE

V THICK MASSIVE ~~BEDDING~~ FINE BLOCKY

NUMEROUS THIN CALCITE STRINGERS

N80E 45SE, + SOME LARGE CALCITE

BLEBS + LENSES ONE ~ 10 cm THICK W WHITE

CALCITE CL. RHOMBS 1-2CM

SMALL DUMP CONTAINS ABUNDANT DK BROWN

~~GOSS~~ CELLULAR GOSSAN MATERIAL CONTAINING

MALACHITE + CHRYSOCOLLA, ABUNDANT ACICULAR

CERUSSITE ? BLADED IN VUGS, AND FEW REMNANT

SMALL GRAINS OF GALENA. GOSSAN MATERIAL

QUITE HEAVY IN WEIGHT.

ABOUT 10 M DUE ANOTHER SIMILAR SHAFT

~10 M DEEP

EXPLORING [illegible] GOSSAN

~ 15 Cm THICK + THIN SHEAR.

GOSSAN N10E 75E. GREEN Cu →

9

STAIN IN DOLOMITE AT SURFACE.
THIS SHEAR PROBABLY SUBSIDIARY TO CERRO GORDO FAULT W. RUNS ~N-S DOWN MIDDLE OF CNYN. ACCORDING TO MERRIAM FAULT TRACE ~ 400 FEET WEST OF ELLA MINE (LOC 1)
THIS LOC. VN TOO SMALL TO BE ECONOMIC

TRAIL HEADS EAST FROM ELLA MINE ~150 M EAST OUTCROP DK GRAY DOLOMITE. BEDDING NOW 53NE

LOC 4 ~ 300M EAST OF ELLA
ADIT S55E ~ 5 M DEEP.
BRECCIATED DK GRAY SACCAROIDAL DOLOMITE OF HIDDEN VALLEY DOLOMITE. ANGULAR FRAGS 1-10cm CEMENTED BY WHT TO LT. TAN CALCITE, CEMENT ~10% OF RK. ~ 1½ M IN FROM PORTAL IS A ZN. OF GOUGE ~ ½ M WIDE PROBABLY A FAULT N25E 73 NW
GOUGE IS FINE GR, POWDERY, LT TAN CALCAREOUS (FIZZES)

~30 M S OF THIS LOC. 2ND ADIT ENTERS HILL N70E IN LT. GRAY SACCAROIDAL HV DOL. →

10

OBSERVATIONS INSIDE ADIT FOLLOW:

AT 35' RED-BROWN FeOX SEAM N7?E

45' TURNS SOUTH

70' TURNS S 65E

85' QTZ VN S65E 65NE ~ 10cm thick

SCATTERED CLOTS + COATINGS

CHRYSOCOLLA & MALACHITE IN

REXLLIZED DOLOMITE ALONG HANGING WALL

FOLLOWS THE ZONE → [illegible]

QTZ IS COARSLY XLN, MILKY, PORCELAINOUS

VUGGY CONTAINS FEW SCATTERED

PYRITE [illegible] < 1%. CHRYS + MALACH

~1%

TOO LOW GRADE TO BE ECONOMIC

PHOTO 10-517

LOC 5 ~ 200 M SW OF ELLA MINE

ACROSS RD ON W SIDE OF SAN LUCAS

CNYN NEAR WOODEN SHACK W GREEN ROOF

2 ADITS ENTER HILL W LT GRAY

16.V. DOL.

A. ADIT N30W ABOUT 15M LONG

PICKS UP QTZ VN ~ 10M IN

VN 10-30 Cm THICK MILKY PORCELAINOUS

CRSLY XLN VUGGY. CONTAINS FEW

WIDELY SCATTERED CLOTS CHRYSOCOLLA

1-2 cm ACROSS. Cu CONTENT - TRACE

(K)

C. ~ 10M S OF A
ADIT ~ 3M DEEP S 10W
IN WEATHERED OVERBURDEN.
DOES NOT PENETRATE FRESH RK.

8/6 LV SAN LUCAS 0830
ARR RIV 1430

(12)

8/9/76
LV RIVERSIDE 1230 – ARR LONE PINE 1730
NITE IN DOW VILLA LONE PINE

8/10 LV LONE PINE 0800 ARR.
SAN LUCAS CYN 0915. MORNING IN
TRAILER.
PM – [illegible] MINE NEAR SOUTH END OF
SAN LUCAS CYN ON EAST SIDE ~2500
FEET N OF CERRO GORDO MINE
PHOTO 10-517 LOC 6

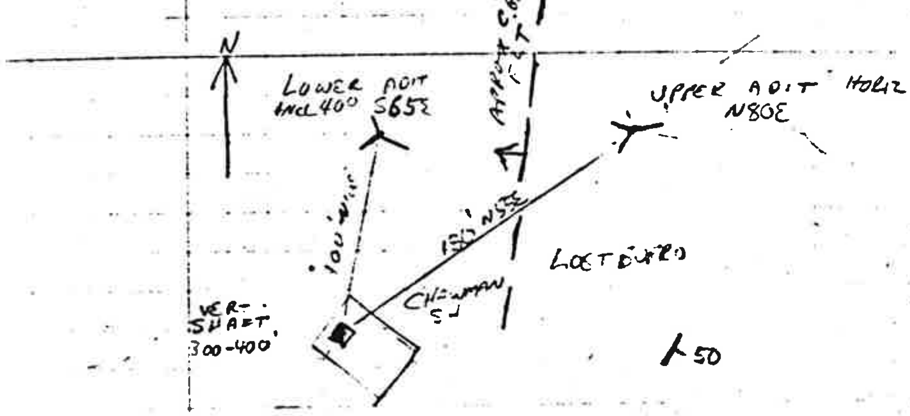
MINE LOCATED ALONG APROX TRACE
OF CERRO GORDO FAULT W TRENDS
APROX N10E W BRINGS ALTERED
CHAINMAN SHALE ON WEST AGAINST
LOST BURRO FM ON EAST. FAULT DIPS V. STEEPLY TO WEST
CHAINMAN WHT TO LT GRAY FINE GR.
BRITTLE BREAKS UP INTO PLATY FRAGS 1–5cm
ACRO LONG. LOST BURRO LT GRAY
MICRITE LS FINELY BANDED SLIGHTLY
SILICIFIED

WORKINGS CONSIST OF SHAFT + 2 ADITS
SHAFT IN WOODEN BUILDING ~300-400'
DEEP IN CHAINMAN SH. DRIFTS PROBABLY
EXTEND EASTWARD INTO LOST BURRO FM

→

60 Wengo ...
975 End

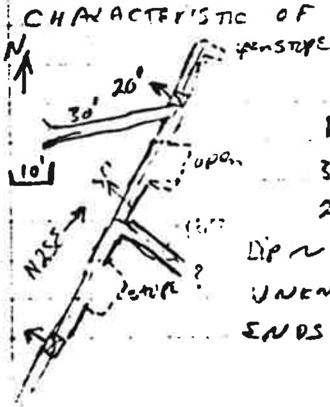
(13)



SEE MERRIAM PROF PAPER 408 p. 74

LOWER ADIT ENTERS SLOPE S65E INCL 40°
W ALTERED LT GRAY CHAINMAN SH
THIS ADIT WAS MAPPED BY MERRIAM
TOO DANGEROUS TO ENTER ALONE

UPPER ADIT ENTERS SLOPE N80E HORIZ
IN LOWER LOST BURRO. AT PORTAL LB IS
LT TO MED GRAY MICRITIC LS FORMING
SMOOTH SURFACES. V THIN CARBON DK GRAY
BANDS SPACED 1-5 cm APART
CHARACTERISTIC OF LB Fm



ADIT MEETS VN 30' IN
FROM SURFACE
VN N25E 50°NW
35' SW OF INTERSECTION
2ND VN TAKES OFF S65E
DIP ~60° NE FOLLOWED BY DRIFT
UNKNOWN DISTANCE. SW DRIFT
ENDS ~90' FROM INTERSECTION
→

(14)

NOTE: PALE GREEN SECONDARY Cu MNRL MAY BE CALEDONITE (Pb Cu Sulfate) WHICH IS COMMON IN CERRO GORDO MERRIAM p 42-43

VN ~ 1 mtr THICK BROWN CELLULAR GOETHITE + CALCITE W STRINGERS ~~of~~ + BLOBS LT GRN SECONDARY Cu MNRL PROB. CHRYSOCOLLA ~ 10%. AT WINZE 60' SW OF INTERSECTION DK GRAY GALENA IN SMALL PATCHY REMNANTS ALTERED TO SECONDARY MNRLS (ANGLESITE OR [illegible]) COULD BE RICH IN SECONDARY Pb MNRLS FOOTWALL OF VN STAINED BRIGHT REDDISH BROWN POSSIBLY BY Pb OXIDES? IN ZONE ~ 5-10cm THICK. STRIKE OF VN ∥ STRIKE OF BEDDING BUT DIPS IN OPP. DIRECTION VN PROB RELATED TO CG FLT
AT SURFACE BEDDING IS N25E 50°SE

ON SURFACE AT OPEN STOPE ABOVE ADIT VN MOSTLY DK BROWN CELLULAR GOETHITE W PATCHES OF CHRYSOCOLLA (?) KB Fm SILICIFIED IN HANG WALL - ROUGH SURFACE, SMOOTH ON HANG WALL - SOME RUGOSE + CHAIN CORAL IN LS HERE

~ 500' [illegible] OF [illegible] [illegible] ADIT
3 OPEN CUTS ON BRECCIATED LS [illegible]
ANG FRAGS LS UP TO 10cm CEMENTED BY WHITE PINK CELLULAR CALCITE W CAVITIES UP TO 1cm LONG. SOME DK BROWN CELLULAR GOETHITE BUT NO MINERALIZATION SEEN

(15)

8/12/76

UPPER NEWTOWN MINE — ~1000 FT
N OF SADDLE AT HEAD OF SAN
LUCAS CYN ON E. SIDE
LOC 7   PHOTO 10-517

PORTAL OF ADIT IN CHAINMAN SHALE
GRAY SHALE W SLIGHT SATIN SHEEN
ON PARTING SURFACES WEATHERS TO
MOTTLED BROWN + DRAB GREEN.
FISSILE.. BREAKING UP INTO CHIPS +
PLATES UP TO 30 cm LONG + UP TO
3 cm THICK. CONTORTED INTO FOLD
AT PORTAL OF ADIT
..BEDS GENERALLY DIP EASTWARD.

UPPER NEWTOWN & NEWTOWN VN PROB. N. EXT. OF CERRO GORDO.

PORTAL ENTERS S80E AZ
CHAINMAN LAMINAE VERT. OR VERY
STEEPLY DIPPING. AT 45' INSIDE
CERRO GORDO FAULT N10E 90°
CHAINMAN AGAINST LOST BURRO TO EAST
DRIFT FOLLOWS FAULT. ABOUT 1-2 M
WIDE ZONE OF BRIGHT RED-BROWN CLAY
GOUGE. EAST OF FAULT LB
GRAY, LAMINATED BEDDING, CRISSCROSSED W
TAN WHITE CALCITE VNS.
210' IN FROM PORTAL VEIN N20E 60SE
~½ - 1M THICK W EXTENSIVE STOPING
+ WINZE ~50' DEEP

→

VN SIMILAR TO NEWTOWN & MAY BE SAME
VN. TYPICALLY BROWN CARBONATE TYPE
VN W BLOBS DK BROWN TO ALMOST
BLACK CELLULAR FROTH UP TO 20-30 cm
W SCATTERED GRAIN MALACHITE (~1%)
+ RARE AZURITE OR LINARITE. THIS
MATERIAL CRISS-CROSSED BY THIN (1mm & LESS
VNS OF WHITE CALCITE FORMING BOXWORKS
MERRIAM GAVES MAP OF UNDERGROUND
WORKINGS (PROF PAPER. 40E p 79-75]

MAY BE [illegible]

SAMPLED [illegible]

DUMP CONTAINS ABUNDANT SPECIMENS OF
ORE, CHIEFLY MIXTURE LT TAN [illegible]
IN GRAINS 1 - 5mm W SEAMS & ENCRUSTATIONS
OF WHITE GLASSY CERRUSSITE (?) XLS < 1mm - 2mm
SCATTERED MALACHITE GRAINS 1-3mm +
OCCASSIONAL WHITE CALCITE BLEBS YIELDING
CL. RHOMBS UP TO 1 CM. FOUND ONE
SAMPLE W SIDERITE GIVING RHOMBS 1-2CM
OR ANKERITE SLIGHTLY CURVED CLEAVAGE FACES. ORE SAMPLES
QUITE HEAVY OWING TO HIGH Pb content

~200' EAST OF ADIT PORTAL VN EXPOSED
BY TRENCHING TO DEPTH OF 20-25' VN
~1 M WIDE N-S 60° E TRENCHING ~
100' LONG. VN SIMILAR TO MATERIAL
ON DUMP. Cu SHOWS AS PALE GREEN
ENCRUSTATIONS 1-2mm THICK ([illegible]?)
BEDDING IN LB N20E 65SE

LOC. 8 PHOTO 10-517

OMEGA TUNNEL S SIDE ROAD AT HEAD OF SAN LUCAS CYN.

ADIT ENTERS SLOPE S20W PENETRATES ~10' OVERBURDEN + INTO LS PROBABLY KEELER CYN FM

ACCORDING TO MERRIAM TUNNEL CONNECTS TO 200' LEVEL OF CERRO GORDO MINE

TUNNEL SEEMS IN GOOD SHAPE BEYOND FIRST 15 FEET

DUMP IS VERY LARGE ALMOST ENTIRELY LS FRAGS (KEELER CYN + L.B) W SOME CHAINMAN SH. SCATTERED SMALL FRAGS CELLULAR FROX (VERY LIGHT) + FEW PIECES ORE SIMILAR TO UPPER NEWTOWN

ACCORDING TO MERRIAM, OMEGA TUNNEL DRIVEN TO PROVIDE 2ND EXIT FROM MINE.

(18)

8/13

ROAD ~~~~ TO TRIBUTARY CYN WEST OF SAN LUCAS CYN OPP. ELLA (SILVER SPEAR MINE)

AT JCT W SLC RD WHITE POST W METAL TAG "LEE NO. TEN - J.D. + B.L. SMITH"

0.2 MI UP RD WHITE POST W METAL TAG
"LEE NO. 11 DISC. POST
PRIVATE PROPERTY NO TRESPASSING
VIOLATORS WILL BE PROSECUTED
CERRO GORDO MINES
JACK D. + BARBARA L. SMITH
OWNERS"

LODE CLAIM LOCATION NOTICE: LEE NO 11. 12 AUG 74
CLAIM 1500' X 300' FROM DISC. MON.
NO DIRECTIONS GIVEN. ADJOINS LEE #10
ADDRESS: JACK D. + BARBARA LEE SMITH
CERRO GORDO MINES
BOX 3
LONE PINE 93545

ACCORDING TO MR RODRIGUEZ, CARETAKER AT CERRO GORDO, SMITH LIVES IN TRAILER IN KEELER (BEHIND GAS STATION)

BOTH POSTS MARKED BY GREEN DOTS ON PHOTO 10-517 (L10 & L11)

.3 MI UP RD SWITCHBACK TO SW
INTO TRIB. CYN

PICTURES: S0119a - VIEW SE ELLA MINE
+ TRAILER IN VALLEY BOTTOM. C.G. FLT APPROX
THROUGH METAL BLDGS, BEHIND H.V. DOL
OVERLAIN BY CLIFF FORMING LOST BURRO LS
+ DK GRAY TIN MTN LS CAPPING
CG PK AT UPPER LEFT.

S0119b - VIEW SW UP TRIB CYN. H.V.
DOL FOREGROUND FLTD AGNST
L.B. LS (BANDED CLIFF FORMER) OVERLAIN
BY DK. TIN MTN LS

AT SWITCHBACK CONTACT BTWN LT
GRAY DOL + OVERLYING DK GRAY DOL.
ATTITUDE BAX. IS GRAY N40E 35SE
DK. GRAY SACCHAROIDAL DOLOMITE, SMALL DK.
CHERT NODULES ALONG SOME BDG. BEDDING
1/4 - 2 M THK OBSCURE. OBT#06. JOINTING
10-30cm SPACING.

UNDERLYING UNIT LT GRAY SACCHAROIDAL
DOLOMITE. THICK BEDDED (SEVERAL MTRS)
BEDDING ALSO N40E, 35-40 SE. NO CHERT

BOTH UNITS HAVE SCATTERED IRREGULAR SHAPED
MASSES OF CRSLY XLN (GRAIN SIZE 1-5mm)
PINK DOLOMITE SHOWING CURVED CLEAVAGE
RHOMBS. MASSES ~ 1-5 cm LONG

→

BOTH UNITS TRANSECTED BY A VN OF CRS. GRND (3-5mm) CALCITE TRENDING N80E DIP 90°. WHITE ~~CALCITE~~ STAINED LT YELLOW.

LT. DOLOMITE UNIT CONTAINS SOME POORLY PRESERVED CORALS, SOME RUGOSE & SOME COLONIAL. W WEATHER OUT W A REDDISH BROWN COLOR.

SEE PROF PAPER 408 P. 12

LT. DOLOMITE TENTATIVELY IDENTIFIED AS MERRIAMS A MEMBER, DK UNIT AS HIS B MEMBER OF H. V. DOLOMITE CONTACT CAN BE TRACED ~ 300 M S TO CNYN FLOOR + ABT ½ MI NE SKETCHED IN ON PHOTO 10-517.

DK UNIT ALSO APPEARS ON E WALL SAN LUCAS CYN

FOOT TRAIL TAKES OFF TO N FROM SWITCHBACK. ~ 300 M N AT THIRD SPUR MARKER "LEE NO. 11 NE CRNR" MARKED LH IN GREEN ON PHOTO 10-517 TRAIL CONTINUES N AROUND SPUR WEST INTO 2ND TRIB CYN THEN CLIMBS N WALL OF CYN. LT GRAY SACC. HIDDEN VALLEY DOL. OCC. POORLY PRES. CORALS.

IN PHOTO 10-517 N. WALL 2ND TRIB CYN. ADIT ENTERS SLOPE IN H.V. DOL

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LOC 10 CONT.

ADIT HORIZ N15E ALONG STRIKE OF FAULT W DIPS 60° SE
50 cm WIDE ZONE RED CLAY GOUGE ALONG FAULT + 20 cm BRECCIATED & SILICIFIED DOL ON HANG + ~~FOOT~~ WALL.
ADIT AT LEAST 100 FEET. ROOF IN BAD SHAPE.

OUTSIDE PORTAL SMALL PILE OF "ORE" CRSLY XLN CLEAR QTZ, VUGGY, GIVES GOOD PRISMATIC XLS UP TO 1 cm LONG & 3 mm IN DIAM. EMBEDDED IN QTZ ~~ARE~~ CLOTS OF CHRYSOCOLLA 1-3 cm DIAM OFTEN WITH CORE OF INDIGO BLUE CRUMBLY MINERAL (CHALCOCITE?). ~~MOR~~ LESS VUGGY QTZ HAS CLOTS OF FINE GR. OR GRAY GALENA UP TO 2 cm LONG. ~~QTZ~~ GALENA RIMMED BY LT TAN MNRL (ANGLESITE?) QTZ CUT BY SEAMS OF SIDERITE OR ANKERITE 1-10 mm WIDE. ALSO SOME WHITE CALCITE.
FROM SIZE OF SOME BLOCKS, QTZ VN AT LEAST 20 cm THICK. SOME SCATTERED PYRITE PSEUDOS 1 ~~4~~ mm <1%
SAMPLE S 0121

TRAIL TAKES OFF WESTWARD & CLIMBS TO CREST OF RIDGE. AT CREST DISC. MON. POST "PINE TREE # 35, JUNE 1966 BY DD BUNN (?) GREEN DOT ON PHOTO

2

TRAIL CROSSES OVER RIDGE + FOLLOWS CONTOUR WEST. CROSSES FAULT W BRINGS LOST BURRO FM ON WEST DOWN AGAINST H V DOL ON EAST.
FROM FRACTURING + OUTCROP PATTERN ON PHOTO FLT APPROX N20E) DIP ~70° SE

LOC 11 ~ 60 m W OF FLT 2 PROSPECTS IN LOST BURRO FM.
LOST BURRO IS LT GRAY MICRITIC LS THINLY LAMINATED IN PLACES VARVE-LIKE

EASTERN PROSPECT SHORT (3M) ADIT W FRACTURED LB NE FLT. NO MINERALIZATION.

WESTERN PROSPECT ADIT N20E ALONG FRACTURING IN LB.
ADIT ~ 5M. JUST INSIDE PORTAL SHAFT ~3M DEEP. SMALL SHOWS OF CHRYSOCOLLA IN WIDELY SCATTERED SMALL GRAINS IN BRECCIATED LB FM

AT CLIFF FACE JUST SW OF LOC 11 LOST BURRO BEDDING N20W 60 NE LBT 60 M. FROM FLT

→

TRAVERSE S BACK INTO 2ND
TRIB CNYN ALONG FLT

LOC 12 PHOTO 10-57 AT HEAD OF
2ND TRIBUTARY ON SW SIDE
2 ADITS ON FAULT SEPARATING
LOST BURRO + HIDDEN VALLEY

LOWER ADIT ENTERS SLOPE DUE SOUTH
FOR 18 METRES. HIGHLY FRACTURED
+ RECRYSTALLIZED LOST BURRO FM
FRACTURES N-S DIP 50°E AT PORTAL
~10 M S OF PORTAL ON SURFACE
RK STAINED RED BY HEMATITE.
ON DUMP CAN FIND A FEW PIECES
OF REXLLIZED LS W GRAINS ~1mm +
SCATTERED SMALL 1-2 mm GRNS + CRUSTS OF
~~CHRYSOCOLLA~~ MALACHITE. < 1%

~150 M S. ON FAULT 2ND ADIT
AT PORTAL 2 ADITS.
LEFT S10W ~ 5 M THEN TURNS
~S 60 W
RT ADIT S40W ~5 M THEN WEST
~2 M,
SAME STORY AS AT LOWER ADIT.
HIGHLY FRACTURED + REXTLIZED
LOST BURRO + HIDDEN VALLEY

W : SCATTERED GRAINS MALACHITE
FEW PIECES MALACHITE ASSOC W DK GRAY
SUBMETALLIC SOFT MNRL (CHALCOCITE ?)
EVIDENTLY MALACHITE ALTERED FROM CHALC.
SMALL SPECIMENS FOUND VERY HEAVY
BUT NOT MUCH OF IT APPARENTLY

SAMPLE S0124

2 SMALL MINES OR PROSPECTS SPOTTED
ON RIDGE TOP SEPARATING FIRST &
2ND TRIBUTARY NOT VISITED FOR
LACK OF TIME

8/13 LV SAN LUCAS 0830
ARR RIV 1430

8/16 - 8/20 ANNUAL LV.

8/23 - 8/27 OFFICE

8/30 LV RIV 1030 ARR
SAN LUCAS 1600 HRS

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8/31
TAKE RD NW OPPOSITE ELLA ~~[illegible]~~
~~ST~~) MINE

MILEAGE
9215.8 JCT SAN LUCAS RD
16.0 SWITCHBACK TAKE OFF POINT 8/12/76
SEE PAGE 19

16.1 MARKER: METAL TAG ON WHITE ~~POST~~ SIGN
"LEE NO. 12 DISCOVERY POST
PRIVATE PROPERTY - J.D. + B.L.
SMITH OWNERS"
NO LOCATION NOTICE

16.25 ROAD ENDS AT MINE. NEAR HEAD
OF TRIB. CYN. ~ 200 MTRS BELOW
BASE OF STEEP CLIFF OF LOST BURRO LS.
PHOTO 10-5?? LOC 13 → N. SIDE OF DRAW LT GRAY THICK
BEDDED SACCAROIDAL HIDDEN VALLEY DOL.
BEDDING 1-3 MTRS ATTITUDE N45E 30NW
MARKER NEXT TO LOADING CHUTE
"WEST END LEE NO 12"
N SIDE OF DRAW IS A TOE OF
ALLUVIAL FAN MATERIAL - UNCONSOLIDATED
GRAVEL W COBBLES + BOULDERS OF LS + DOL UP TO
2 MTRS LONG IN SANDY MATRIX.
OUTCROPS OF H.V. DOL S OF TOE
GRAVEL MOSTLY HV DOL + L.B. FM
SOME DK GRN DIKE RK

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ADIT ENTERS SLOPE IN 11.½ DOL
S80 W . RAILS COME OUT OF ADIT
TO ORE LOADING CHUTE ~30M E OF
PORTAL

15M INSIDE. VN ENCOUNTERED N85E 37 N.
~40CM THICK. MOSTLY RED-BROWN
FINELY CELLULAR FROTH W POCKETS OF
WHITE TO CLEAR QTZ XLS GROWING INTO
OPEN CAVITIES. POCKETS UP TO 10 CM,
XLS UP TO 1CM LONG. FOOTWALL OF
VN LACED W THIN (1-2mm) VNS
OF MALACHITE IN ZONE ~1M THICK,
YELLOW JAROSITE(?) OCCURS AT BASAL
CONTACT OF VN. SOME STRINGERS
MALACHITE & JAROSITE(?) W VN ALSO BUT
NOT ABUNDANT

~25M INSIDE VN CUT OFF BY FAULT
N40E 65NW. BEYOND DOLOMITE
HAS SCATTERED VNS & POCKETS OF
SIMILAR FROTH

25-30 MTRS. TUNNEL CURVES TO S65W

32 M. PICKS UP ANOTHER VN N65E 90°
NO MALACHITE

38 M. FAULT N5E 80 E. SHORT DRIFT
FOLLOWS ~3M S. →

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40 MTRS. DRIFT ENDS IN LG ROOM ~ 10M LONG (NS) X 3M EW. ROOF STOPED UPWARD ALONG VN ~ 10 MTRS VN ~ 2 MTRS THICK N5W, 80° E. BRECCIATED LT. DOL. W BROWN [illegible] FeOX, QTZ XLS. + SCATTERED MALACHITE. VERTICAL WINZE DROPS DOWN ~ 15 MTRS GOOD LADDER. FROM S END OF ROOM - DRIFTS TAKE OFF N & S FROM ROOM

SOUTH DRIFT S 5W

12 MTRS. VERT STOPE ~ 6 MTRS UPWARD ORE ZONE ~ 2 MTRS THICK W ABUND MALACHITE W FeOX + QTZ.

MORE STOPING AT ~ 20 MTRS DRIFT ENDS AT 25 MTRS WITH WINZE ~ 6 MTRS DEEP INCLINED ~ 75° EAST ZONE OF BRECCIATION ~ 3 MTRS WIDE CHARACTERIZED BY BROWN HEMATITE + BLACK GOETHITE. SOME YELLOW JAROSITE (?) VERY LITTLE MALACHITE. SHEAR SURFACES COATED W BRIGHT RED BROWN CLAY.

→

(28)

NORTH DRIFT NSW

6M VN ~ 1MTR WIDE. QTZ, FCUT, CL[illegible], [illegible]
W STRINGERS OF GALENA ~2CM WIDE + 10-15CM LONG, MALACHITE STRINGERS <1CM WIDE + 10-20CM LONG.
STOPING FROM BELOW ALSO FOLLOWS THIS ZONE, up to NORTH QTZ MASSIVE, SMOKY UNLIKE WHITE CRSLY XLN STUFF IN [illegible]

15 MTRS DRIFT ENDS. VN THINNED DOWN TO ~10cm ~~[illegible]~~ [illegible] OXIDIZED MATERIAL

GENERAL: MINERALIZATION APPEARS SIMILAR TO ELLA + NEWTOWN MINES. HIGHLY OXIDIZED MATERIAL PROBABLY RICH IN CERUSSITE +/OR ANGLESITE & MAY HAVE CARRIED SOME SILVER & ZINC ALTHOUGH NO EVIDENCE SEEN. & MASSIVE QTZ VN. PRIMARY ~~[illegible]~~ GALENA IN NORTH DRIFT MAY BE BECAUSE DEEPER BELOW SURFACE (ELEVATION OF SURFACE 100-200' HIGHER OVER N DRIFT THAN S DRIFT WHICH IS UNDER CNYN FLOOR. ASSOC W GALENA WAS SOME [illegible] + CHALCOCITE.
PRIMARY Cu MIN'L NOT SEEN [illegible] →

WOULD GUESS IT MAY HAVE BEEN ~~TETRAHEDRITE~~
AS AT ELLA MINE. COARSELY XLN
WHITE CALCITE OCCURRED IN IRREGULAR
MASSES SEVERAL PLACES IN MINE. MASSES
UP TO 20 CM LONG W CLEAVAGE RHOMBS
UP TO 1 CM. ALSO SOME YELLOW SIDERITE (?)
OR ANKERITE (?)

LOC 14 PHOTO 10-517

SMALL PROSPECT ON FAULT IN HV. DOL.
~ 125' NW OF LOC 13. FAULT N12W
60° NE. DISCONTINUOUS DK BROWN
GOSSAN + STRINGERS OF CALCITE IN
CRUDE ORTHOGANAL PATTERN. LOC.
APROX OVER N DRIFT. FEW SCRAPS
OF MALACHITE ON DUMP.

~ 40 M SW OUTCROPS OF LOST BURRO FM
SHEET FRACTURING N20W 90° ~~[illegible]~~.
THIS ZONE MARKS TRACE OF FAULT
SEEN TO NORTH (p 22) & EXTENDS
SOUTH TOWARD CERRO GORDO.
LOST BURRO FM AGAINST H.V. DOL.

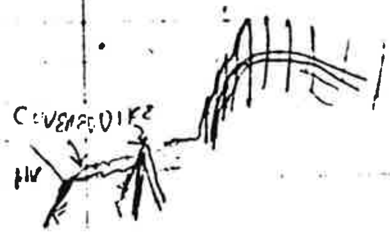
NEAR BASE OF CLIFF ALONG FLT
DIKE ~ 5 M THICK ∥'s FAULT →

STEEPLY DIPPING SW

DIKE N30W ~~VERT~~ ~ 20 M LONG
DK GRN PORPH- PHENOCRYSTS WHITE
PLAGIOCLASE ~~ALTER~~ PARTLY ALTERED TO CLAY
(CRYSTS, 1–5 mm, ~20%) IN
DK GRN CHLORITIC GROUND MASS. THIN
PLATY FRACTURING OF DIKE AT SW
CONTACT

CLIFFFACE LT GRAY LOST BURRO FM.
MICRITIC LS. MARKED BY WELL
DEVELOPED SHEET JOINTING TRENDING
N15W DIP ~ VERTICAL. SHEETING
SPACED ½ CM TO 1 MTR. BASE OF
CLIFF LITTERED W PLATES +
SLABS THAT HAVE SPALLED OFF
CLIFF FACE. SHEETING
PROB. DEVELOPED IN SYMPATHY TO
FAULT.

N.W. ALONG CLIFF REENTRANT CUTS ~
20 MTRS INTO CLIFF FACE. SHEETING
WEAKER. BEDDING ~ N50E 21SE
IN ZONE OF SHEETING BEDDING IS
DRAGGED DOWN + IS ∥ TO SHEETING



INDICATES DRAG
FOLDING ALONG
FAULT.

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Loc 15 photo 10-517

2 PROSPECTS IN SHEETED LOST BURRO FM, SOME DK BROWN GOETHITE BUT NO MINERALIZATION OBSERVED. BEDDING DIPS ~20-30 IN APROXIMATE EAST DIRECTION. (COULD NOT GET EXACT READING

CLIMBED ~ $\frac{1}{4}$ MI FURTHER UP CYN

NO EVIDENCE OF MINERALIZATION

Loc 16 PHOTO 10-517

NEAR BOTTOM OF TRIB CYN ON N FACING SLOPE ~ 200 YDS N OF SAN LUCAS

SMALL PROSPECT ~5m x 3m + $1\frac{1}{2}$ M DEEP IN OVERBURDEN COVERING H.V. DOL. EXPOSES BAND OF REDDISH BROWN SO W TRENDS ~ N70W. NO MINERALIZATION. WHITE POST W METAL TAG LEE NO 10 NW COR.?, LEE NO 11 SW COR., LEE 12 SE COR.

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9/1/76

LOC. SWITCHBACK SAN LUCAS CYN RD. AT OMEGA TUNNEL. FOLLOW OLD TRACK NW

1922.4 JCT SAN LUCAS CYN RD. CHAINMAN SH.
220.5 RD ENDS. TRAVERSE NW ON FOOT

LOC 17 PHOTO 10-517
OUTCROPS OF GRAY MICRITIC LS (LOST BURRO OR TIN MTN ?) POKING THROUGH CHAINMAN SH. DETRITUS. ADIT ENTERS HILLSIDE S75W. AT PORTAL MILKY QTZ VEIN CUTS LS. ATTITUDE N75E 35SE. VN ~ 1½ MTRS THICK HEAVILY STAINED DK BROWN BY FeOX. OUTSIDE PORTAL RUINS OF OLD BLAST FURNACE. ABUNDANCE OF BLACK + DK GREEN SLAG ON DUMP. DUMP ALSO HAS SOME BLOCKS OF FRACTURED MILKY QTZ W THIN COATINGS MALACHITE.

INSIDE ADIT ROCK IS HIGHLY ALTERED GRANITIC INTRUSIVE. MAFIC MNRLS COMPLETELY ALTERED TO LIMONITE →

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PROBABLY QTZ MONZONITE

AND FELDSPARS TO WHITE CLAY. MAFICS PROBABLY 10-15%. SEVERAL SHEARS CUT GRANITE TRENDING ROUGHLY N-S. W ARE HEAVILY STAINED BY LIMONITE. GRANITIC INTRUDES DK GRAY LS IN PLACES THINLY BANDED. ~~MAY BE 1ST BUSTO FM.~~ ~~LAMINATION~~ DI BANDING

NO ITB HIDDEN VALLEY

DIPS MODERATELY ~~SE~~ parallel contact WITH GRANITIC. SEEMS TO BE SILL LIKE AT LEAST NEAR PORTAL.

ADIT DRIFTS STRAIGHT IN S75W ~50 M.
AT 35M SIDE DRIFT S25W ~7 M
AT ~142M SIDE DRIFT N65W ~12M
ENDING IN WINZE INCLINED 50° S35W AT LEAST 15 MTRS DEEP.
NO MINERALIZATION SEEN BUT MAY HAVE BEEN SOMETHING IN WINZE.
AT TOP OF WINZE WALLS COATED W COARSE XLN CALCITE.

CONTINUE TRAVERSE NW

~200' NW OF LOC 17 OUTCROP LT GRAY MICRITIC TIN MTN Fm : CRISS-CROSSED WITH THIN STRINGERS + BLEBS WHITE CALCITE & ABUND. POORLY PRESERVED CORAL FOSSILS
200' SW OUTCROP DK GRAY TIN MTN LS. OUTCROPS W GREEN 10-517 →

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QTZITE FINE GR MASSIVE RESEMBLING CHERT

~300' WEST OF THESE OUTCROP IS ELONGATE BODY GRAY TO BUFF FINE GR. DENSE MASSIVE QTZITE. ALMOST PURE SILICA. BODY ~ 500' LONG TRENDING N45W. ~~DV~~ CANNOT DISTINGUISH BEDDING: HIGHLY FRACTURED IN CRUDE ORTHOGONAL PATTERN. FRACT. SPACED 1-10 cm. PARTS OF QTZITE CUT BY STRINGERS + BLEBS OF WHITE CALCITE ∥ FRACT. PATTERN

LOC 18 ~ 1/4 MI NW OF LOC 17 + ~ 1/2 MI W OF NEWTOWN MINE

OUTCROP OF TIN MTN LS OVERLAIN BY QUARTZITE

TIN MTN DK GRAY MICRITIC, SLIGHTLY SILICIC LS. BEDDING N30W 35 SW 10-50 cm THICK.

OVERLYING QTZITE LT GRAY TO BUFF FINE GR AS AT PREVIOUS LOCALITY. SLIGHTLY CALCAREOUS. 2 SMALL PROSPECTS ~ 15' x 6' x 5' DEEP. MINOR TRACES OF CHRYSOCHOLLA IN PROSPECT. QTZITE APPEARS TO BE 100' THICK AS A MAXIMUM. CONTAINS BUFF COLORED CHERT NODULES 10-20 cM IN SOME LAYERS. QTZITE CONTINUES NW ACROSS CYN TO TOP OF NEXT RIDGE + IS OVERLAIN BY CHAINMAN SH.

HEAD OF DRAW DIRECTLY OPPOSITE NEWTOWN MINE
LOC 19 PHOTO 10-517
4 PROSPECTS IN NW-SE LINE IN QUARTZITE. JUST ABOVE TIN MTN LS. DESCRIBED FROM NW TO SE

① SHAFT INCL S75W 60° ~25' DEEP AT CONTACT TM & QTZITE. CONTACT INTRUDED BY ALTERED INTRUSIVE SILL. (WHITE FELDSPAR PHENOCRYSTS 3-5 MM, ~20%, ALTERED TO CLAY IN TAN FINE GR ARGILLIC GRND MASS) HANGING WALL OF SILL IS A QTZ VN. ~~?~~ ½ TO 1M THICK PINCHES & SWELLS. MASSIVE WHITE FINE GR QTZ HIGHLY BRECCIATED IN CRUDE ORTHOGANAL PATTERN & HEAVILY STAINED RED-BROWN BY FeOx. THIN (≤ 1cm) CHRYSOCOLLA SEAMS ALONG FOOTWALL OF VN. ABOVE VN QTZITE SLIGHTLY REXLLIZED - COARSER GR. GIVES GLITTERY APPEARANCE.

② ~40M SE OF #1. PROSPECT IN SIDE OF HILL ~ 6'X6' X 8' DEEP, NE SIDE OF CUT IS ALTERED PORPHYRY TRENDING NS DIPPING NEAR VERTICAL. PINCHES & SWELLS 10-50cm THICK. SW SIDE IS TIN MTN LS DIPPING STEEPLY SW. CENTER OF CUT IS TIN MTN CUT BY

MASSIVE MILKY QTZ BLEBS. <u>NO FOXY STAINING</u>. <u>NO MINERALIZATION</u>

3 17M SE OF 2. CUT ~ 15'x10'x 10' DEEP. ~~QTZITE~~ OVERLAIN BY TIN MTN CON. [illegible] DIP ~ 80° SW CONTACT BRECCIATED WITH TIN MTN CONTAINING NUMEROUS ANGULAR FRAGMENTS OF CHERT UP TO 1CM LONG. <u>NO</u> ~~[illegible]~~ PORPHYRY OR QTZ VN OR ANY SIGN OF <u>MINERALIZATION</u>

4 ~23M SE OF 3. PIT ~ 15'x10'x 10' DEEP ENTIRELY QTZITE MASSIVE LT TAN QTZITE FRACTURED — BRECCI UP INTO ANGULAR BLOCKS 5-15 cm LONG. QTZITE CUT BY 2 SHEARS ~ 2 MTRS APART

BOTH SHEARS N15E 60 NW ABOUT 20 CM THICK. CNTR OF SHEAR BROWN ARGILLIC GUNK FLANKED BY PALE YELLOW-GREEN CRUMBLY STUFF. QTZITE ON BOTH SIDES OF SHEAR LACED WITH <u>CHRYSOCHOLLA</u> VNLETS (~10%) W ZONE 10-15 CM WIDE

NOTE: ACCORDING TO MERRIAM (PROF. PAPER 408, p. 18) →

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THE TIN MTN IS OVERLAIN UNCONFORMABLY WITH SHARP CONTACT BY A FINE-GRAINED QUARTZITE MEMBER W CONSTITUTES A WESTERLY TONGUE OF THE [illegible] FM. THIS TONGUE DISAPPEARS AT SOME POINTS AS THE TIN MTN THINS OUT SUGGESTING DISCONFORMITY. THIS IS THE CHERTY-LOOKING QTZITE DESCRIBED ABOVE.

QTZITE IS PERDIDO FM

RETURNING TO TRAILER MET MR.
W. PAUL PAYNE BOX 212
KEELER 93530
(714) 876-4491
CORNER [illegible] AVE + LINCOLN AVE.
HAS FILED ON THE ELLA MINE.
JACK SMITH FORMERLY HELD CLAIM BUT NEVER DID ANY ASSESSMENT WORK. PAYNE SAYS HE PLANS TO WORK DUMP WITH A DRY PROCESS HE HAS DEVELOPED & WILL SET UP A MILL FURTHER DOWN CYN. CLAIMS CAN GET $30/TON AG + RECOVERABLE PB FROM DUMP. VERY FRIENDLY - NO OBJECTION TO KEEPING TRAILER AT ELLA MINE. OFFERED MAP SHOWING CLAIMS IN AREA. SAYS SMITH IS

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TYPE WHO WILL SHOOT FIRST & ASK QUESTIONS LATER.

9/2
LOCATION SWITCHBACK CAN LUCAS RD OPPOSITE NEWTOWN MINE AT BASE OF WEST SIDE SLOPE. FOOT TRAIL GOES NORTH FROM SWITCHBACK

LOCATION 20 PHOTO 10-577

340' N. ON TRAIL. HIDDEN VALLEY DOL. LT GRAY MASSIVELY BEDDED (CAN'T SEE BEDDING) SACCAROIDAL. ADIT ENTERS SLOPE DUE WEST ALONG STRIKE OF 5CM WIDE QTZ VN. CRSLY XLN VUGGY MILKY QTZ W XLS 5MM LONG GROWING INTO VUGS. VN EW 1 70 N ADIT 25' LONG SHOWS NO MINERALIZATION. BLOCK AT PORTAL SHOWS XLS GALENA ~ 5MM. APPROX 1% EMBEDDED IN QTZ.

115' FURTHER NORTH 2ND ADIT IN HIDDEN VALLEY DOL. ALSO DUE WEST SOME BLEBS OF MILKY QTZ LIKE ABOVE W SCATTERED XLS GALENA (5MM ~ 1%) SIMILAR BLEBS 20-60 CM long SEEN INSIDE. ADIT 55' LONG. ~ ? TONS OF GALENA "ORE" STOCKPILED OUTSIDE

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BESIDES GALENA BEARING MILKY QTZ, ALSO SOME YELLOW-GREEN STAINED QTZ INDICATING PYRITE? + TRACES OF CHALCOCITE + CHRYSOCOLLA. ALSO SOME FINE GR GARNETIFEROUS ... (GRANULITE

LG BROWN ... 3" V. LG ... BACK OF ...

RETURN TO SWITCHBACK. HIKE NW UP ...

LOC 21 PHOTO 10-517

PROSPECT CUT ~ 30' x 10' x 8' DEEP ON FAULT SEPARATING HIDDEN VALLEY DOL + LOST BURRO LS. SAME FAULT AS IN TRIBUTARY CYN TO SOUTH. HIGHLY FRACTURED H.V.D. CUT BY NUMEROUS WHITE CALCITE SEAMS 1-5mm WIDE. LOST BURRO WHITE, HIGHLY FRACTURED + RECRYSTALLIZED, SOME SILICIFICATION. FAULT ZONE BRECCIATED CARBONATE ROCK WITH LARGE VNS + BLEBS OF VERY COARSE GR. GRAY TO AMBER CALCITE WITH CLEAVAGE RHOMBS UP TO 5 CM. BRECCIA ZONE IMPREGNATED BY SILICEOUS ARGILLIC MATERIAL COLORED BROWNISH ORANGE BY FeOx (OR POSSIBLY PbOX'S. CARBONATES RECRYSTALLIZED BUT NO EVIDENCE OF SULFIDE MINERALIZATION. A FEW SMALL MASSES OF ...-BROWN + BLACK FeOX ~~GOETHIT~~ GOSSAN MATERIAL (HEMATITE + + CALCITE → GOETHITE). FAULT STRIKES N10-20W + DIPS 60-70° NE

21

LOST BURRO CUT BY MILKY MA[illegible]
QTZ VNS STRIKE ~ N40W DIP ~ [illegible]
LGST VN ~ 1 MTR THICK. NO MINERALIZATION
VISIBLE IN THESE VNS

HIKED ~ 100 YDS. N TO OVERLOOK INTO
NEXT CYN. CAN SEE FAULT CLEARLY
ALONG [illegible]
& 2 YELLOW ORANGE ZONES NEAR [illegible]
OF NEXT RIDGE NORTH. LOST BURRO
& TIN MTN SHOW V GOOD VERTICAL
SHEET JOINTING STRIKING ~ N20W
// TO BEDDING. CONTACT NEAR VERTICAL
TO ~ 80° SWEST

LOC 22 PHOTO 10 - [illegible]

~ 200 YDS WEST OF LOC 21 OFFSITE
SHAFT INCL 65° S 85 W IN TIN
MTN LS. SHAFT ~ 30' DEEP
FOLLOWS ~~DIKE~~ PORPHYRY DIKE DOWN
DIP (DIKE N5W 65°W). DIKE ~ 1M
WIDE. PHENOCRYSTS WHITE FELDSPAR 3-5 mm
~ 20% IN FINE GR GRAY GROUNDMASS
SOME BLACK GOETHITE ENCRUSTATIONS
& RED HEMATITE STAIN ALONG HANGWALL
OF DIKE.
TIN MTN LS DK GRAY PLATY LS
W ABUND BROWN CHERT NODULES
⇒

(11)

1.-5 CM LONG + SOME CRINOIDAL HASH. BEDDING THIN, PLATY — N-S 90° E. SIDE OF DIKE; N25W 55SW W SIDE OF DIKE. DIKE PROB INTRUDED ALONG FAULT OR SUBSIDIARY FRACT.

NO VN SEEN AT TOP OF SHAFT BUT DUMP CONTAINS CHUNKS OF FINE GR MASSIVE MILKY QTZ. NO MINERALIZATION SEEN

LOC 23 PHOTO 10-5-7
~250 YDS S OF LOC 21
PROSPECT ON FAULT SEPARATING TIN MTN + HIDDEN VALLEY (LOST BURRO FAULTED OUT ~ 50 YDS NORTH TIN MTN SLIGHTLY LIGHTER COLORED + LESS CHERTY. THIN BEDDED - ATTITUDE N5E 80°E.

HID. VLY DOL TYPICAL GRAY SACCAROIDAL THICK BEDDED DOLOMITE. SOME POORLY PRESERVED CORAL FRAGMENTS

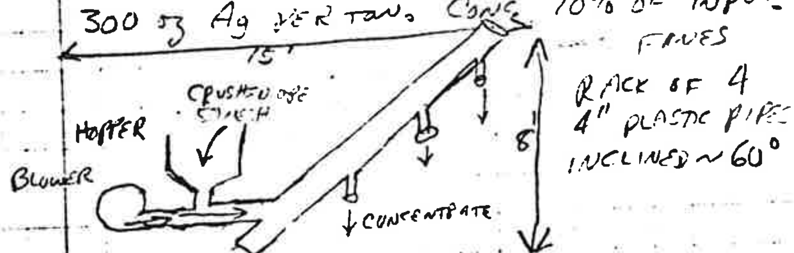
PROSPECT ~8' SQ & 3' DEEP. PULVERIZED LS. W EDGE OF PIT. BRECCIATED MILKY QTZ VN (FINE GR., MASSIVE) ~ 15 CM THICK. RED HEM STAIN ALONG →

HANG WALL IN 25CM WIDE ZN
NO MINERALIZATION SEEN

VN ATT. N5E 35 W

LV. SAN LUCAS 1600

PICKED UP CLAIM MAP OF CERRO GORDO AREA FROM PAUL PAYNE IN KEELER. HE SAID IT WAS FROM OLD SILVER SPEAR MINING CO (HART MINE ?) MAP LEGEND HAS NO DATE BUT SAYS ACCOMPANIES REPORT BY TUCKER + SAMPSON. (PROBABLY FROM '30S. SAW EQUIPMENT FOR DRY PROCESSING ELLA DUMP. CLAIMS CONCENTRATE YIELDS 300 OZ Ag PER TON. CONC. 10% OF INPUT FINES



WHOLE UNIT PORTABLE ON TRAILER

ARR. LONE PINE 1730 HRS. NIGHT IN DOW VILLA

9/3 CHECK FRONT END RAMCHARGER FOR DAMAGE AT GARAGE. LV. LONE PINE 1000 HRS - ARR. RIV 1430 HRS.

9/6 - 9/17 OFFICE

9/20 LV RIV 1120 VIA BLM VEH
ARR LONE PINE 1630. RAINING
AT CERRO GORDO. NIGHT IN
DOW VILLA - LONE PINE

9/21 LV LONE PINE 0800 ARR
SAN LUCAS CYN 0930

FLAT TIRE RETURN TO LONE PINE
RETURN SAN LUCAS 1100 HRS
DROVE DOWN SAN LUCAS CYN
TO SCOUT OUT FUTURE WORK

9/22 LOC SADDLE AT SOUTH END OF
SAN LUCAS CYN.
KEELER CYN FM GRAY TO BUFF
MICRITIC LS W INTERBEDS OF
SLIGHTLY SANDY & ARGILLIC LS
BEDDING ~3-15 cm THICK. CONTAINS
FEW SCATTERED POORLY PRESERVED
FUSULINIDS. OUTCROPS LOW (< 3m HIGH)
+ SUBDUED DUE TO THIN BEDDING.
BREAKS UP INTO PLATY TO BLOCKY
FRAGS 3 - 10 cm LONG.
ATTITUDE OF BEDDING N10W 45 SW

THIS BODY OVERLIES CHAINMAN SH
AT OMEGA TUNNEL. THIN STRIP OF
CHAWMAN SH. SEPARATES KEELER CYN FM
FROM SAN LUCAS CYN FAULT
EAST OF OMEGA TUNNEL

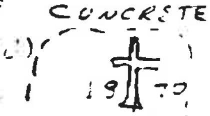
OLD RD TAKES OFF N FROM SADDLE
ALONG W SLOPE OF [illegible]
4 STONE FOUNDATIONS OF BUILDINGS
ALONG RD. 550' [illegible]
FOUNDATION CONTACT KEELER CYN &
CHAINMAN. AS BEDS OF BOTH FMS
STRIKE INTO EACH OTHER, CONTACT
IS A FAULT. CHAINMAN IS SH,
PLATY TO BLOCKY COATED RED-BROWN
BY HEM. ALONG PARTINGS. ALSO LOCALLY
MOTTLED SPLOTCHES OF [illegible] GREEN.

LOC. 24 PHOTO 10-517
ADIT & PROSPECT IN KC FM
WEST SIDE OF SADDLE. ADIT
S55W ~ 10 METERS, PROSPECT ~
3M X 3M X 2M DEEP. NO MINERALIZATION
IN EITHER. SOME WHITE CALCITE STRINGERS &
SMALL WHITE CALCITE SPECS W MAY BE
REMAINS OF MICROFOSSILS. ADIT
PARTLY CAVED LEAVING TRENCH ~ 7M
LONG STARTING 3M FROM PORTAL.

LOC 25 PHOTO 10-517
CUT IN HILLSIDE ~20' X 30' X 5' DEEP
IN KEELER CAN FM. GRAY MICRITIC
LS. THICKER BEDDED THAN PREVIOUSLY
DESCRIBED (15-30cm) NO FOSSILS
EVIDENT NO MINERALIZATION
CHAINMAN SH CROPS OUT 30' WEST
OF CUT CONTACT W KC FM NOT
EXPOSED CONTACT TRENDS ~ N-S

DRIVE NORTH ALONG UPPER ROAD FROM
SADDLE.
ROAD LOG

19727.0 JCT CERRO GORDO RD IN SADDLE
27.2 OUTCROPS KCFM AT RT BEND IN RD
27.23 CONTACT KC + CHAINMAN 60' FROM CONT
PICTURES 014 CEMETERY MINE FRAN. N. 100' N OF RD CONCRETE MONUMENT
~2' HIGH (SOLID)



LEST WE FORGET

27.4 PROSPECT N CHAINMAN NO MINERALIZATION
27.5 PROSPECT IN " " "
27.55 3 SHACKS SHOWN AS HART CAMP ON
MERRIAM'S MAP
27.6 CONTACT CHAINMAN / HART CAMP STOCK
STOCK IS GRAY MED GR HORNBLENDE
MONZONITE ... HBL ~10% IN
EUHEDRAL TO SUBHEDRAL XLS 3-5mm LONG
→

(96)

FELDSPARS APPROX EQUAL PLAG + K SPAR
K SPAR WHITE OVOID ANHEDRAL XLS
2 - 10 mm W SOME INTERGROWN PLAG.
PLAG. WHITE GLASSY EUHEDRAL - SUBHEDRAL XLS [illegible] mm
[illegible] IN HYPIDIOMORPHIC-GRANULAR [illegible]
SURROUNDING K SPARS. ROCK FAIRLY
FRESH TRACES OF QTZ.
MERRIAM (p 32) CALLS IT A MONZONITE
PORPHYRY + SIMILAR TO UNION CHIMNEY
AT CERRO GORDO. MERRIAM SHOWS STOCK
ON HIS MAP W APPEARS TO BE [illegible]
CORRECTLY.
SAMPLE S-0146

27.35 ~ 200' SW OF RD PROSPECT 20'x15'x5' DEEP
IN LT GREENISH GRAY SILICEOUS CHAINMAN SH.
EXPOSES QTZ VN ~ 25 cm WIDE
MASSIVE MILKY (BULL QTZ) W TRACES
OF DEEP BLUE SECONDARY CU [illegible]
([illegible]) VN TREND N 50° [illegible] THIN
YELLOW BROWN FE OX COATINGS +
SOME OLIVE DRAB ENCRUSTATIONS (Ag ?)
CONTACT HART STOCK ~ 100' S [illegible]
FRAGS OF VN IN FLOAT CONTAIN
MALACHITE + REMNANTS OF CHALCOPYRITE
ALTERED TO CHALCOCITE

28.45 FORK. TAKE LEFT FORK
→

47

28-35 LOC 27 PHOTO 10-517
HART MINE
INCLINED SHAFT ON TIN MTN -
PERDIDO CONTACT.
TIN MTN LS DK GRAY MICRITIC LS
PERDIDO LT TAN FINE GR MASSIVE
QUARTZITE
SHAFT INCL 50° S80W DOWN DIP OF
CONTACT (IE CONTACT N10W 50SW)
WORKINGS INACCESSIBLE. DUMP HAS
SLID DOWN OVER CLIFF. FEW SCRAPS
OF MALACHITE AROUND.
ACCORDING TO MCKNIGHT (P72) LEVEL WAS [illegible]
[illegible] AT [illegible] 50, 150 + 200
FOOT LEVELS. NE [illegible] 50'
LEVEL. QTZ VN FOLLOW [illegible] - UP TO
1½' THICK W LIMONITIC MATERIAL [illegible]
SMALL POCKETS OF [illegible]
PbCO₃ + [illegible]. VN IS [illegible]
+ PINCHES DOWN N+E OF SHAFT ON
50' LEVEL. GIVES SMELTER RETURN OF
ONE 40 TON SHIPMENT IN 1920
BELIEVED FROM THIS MINE.

RT FORK GOES TO CONCRETE BUILDING
AT TOP OF RIDGE. GOOD SHELTER.
FOUNDATION OF WHAT MAY HAVE BEEN A
MILL.

→

(28)

TAKE FOOT TRAIL NW FROM FORKS
+ FOLLOW RIDGE NORTHEAST

LOC 28 PROSPECT + ADIT ALONG
ANDESITE PORPHYRY SILL IN
LOST BURRO FM.
LOST BURRO LT GRAY TO WHITE
FINE GRAINED LS. MASSIVELY
BEDDED 30 cm THICK + SCATTER
BEDDING N20E 53 NW
ANDESITE GRAY GROUNDMASS
PHENOCRYSTS OF WHITE PLAG ~
3-5 mm (~15%) DIKE
MAY BE SAME AS IN THE CYN (P. 40
ADIT INCLINED 45° DUE WEST
AT LEAST 30' EXPLORES QTZ VNS
IN LOST BURRO ALONG
OF SILL. QTZ VNS 10-30 cm
DIP GENTLY WEST, COARSELY
MILKY QUARTZ VUGGY CONTAINS
CLOTS OF CELLULAR LIMONITE +
SCATTERED XLS OF CHALCOPYRITE
UP TO 1 cm W ALTERATN RIMS OF
CHALCOCITE + MALACHITE. ~10% Cu
MNRLS. SOME LIMONITIC CUBIC
PYRITE PSEUDOS W FRESH SURFACES

SAMPLE S 0148.

RETURN TO TRAIL FROM [illegible]
N. PAST OLD WRECKED [illegible]
LOC 30 PROSPECT ~ 6'×3'× 2' DEEP
IN TN MTN LS QTZ VN N20E, 90
~ 8cm THICK, COARSELY XLN VUGGY
MILKY QTZ W TRACES OF MALACHITE

LOC 31 PHOTO 10-517
2 PROSPECTS IN TN MTN LS
① NORTHERN ADIT ~ 7 METERS
DIKE OF GRAY GREEN ANDESITE OR
DACITE PORPHYRY W PHENOCRYSTS OF
ARGILLIZED FELDSPAR [illegible] (~1cm),
AT PORTAL. DIKE ~ N50W [illegible]
~5' THICK. QTZ VN ~ 20cm
THICK [illegible] TN MTN ALONG
FOOTWALL OF DIKE (SAME ATTITUDE)
COARSELY XLN MILKY QTZ SHOWS
TRACES OF MALACHITE + WEAK
FeOX STAIN (YELLOW-BROWN), + A FEW
SCATTERED CLOTS CELLULAR SULFIDE

② ~10' SOUTH OPEN TRENCH & CAVED
ADIT FOLLOWS QTZ VN (N10E, 70)
IN T.M. LS VN ~ 20cm THICK
CRSLY XLN MILKY QTZ. ABUNDANT ENCRUSTATION
BRIGHT RED-ORANGE MATERIAL ([illegible]?)
SCATTERED CLOTS OF MALACHITE ~
1 cm. ACROSS COMMON (MORE SO THAN

→

(60)

#1 JR LOC 30) VN SEEMS TO BE REPLACEMENT ALONG JOINT (SMALL REMNANTS OF LS WITHIN VN)

SMALL FAULT (N20W, 90) CUTS TM AT PORTAL OF ADIT W SIMILAR MINERALIZATION ALONG IT
EAST OF FAULT BEDDING N65W 35SW
WEST " " " N70W 65SW

WEST OF FAULT BEDDING OVERTURNED NEAR WEATHERED ZONE DIPPING STEEPLY NORTH. EXCELLENT EXAMPLE OF EFFECTS OF SOIL [illegible]

TRAIL CONTINUES NORTH BUT NO TIME TO EXPLORE. MAY BE MORE PROSPECTS LIKE THESE

(51)

9/23

ROAD LOG

19732.15 SADDLE AT CERRO GORDO TAKE
LOW ROAD NORTH. VERY NA[illegible]
+ TREACHEROUS THROUGH CHA[illegible] 54

33.25 FORK 1. RT FORK PETERS OUT INTO
FOOT TRAIL W LE[illegible] " TO C[illegible]
TUNNEL + FARTHER [illegible]
TAKE LEFT FORK

33.3 FORK 2 TAKE LEFT FORK

33.4 RD ENDS OUTCROPS KEELER C[illegible] TOP OF [illegible]

33.5 RETURN FORK 2. [illegible] ROAD [illegible]
DOWN INTO VALLEY. [illegible] TO
SWANSEA AT ~ 39.[illegible]. [illegible] OUT
OF VALLEY [illegible] SWITCHBACKS ONTO FLAT
AT CREST OF [illegible]

36.1 OLD WOODEN WATER [illegible] PART OF
CERRO GORDO [illegible] NE

36.4 SADDLE TURN OFF LEFT TO S[illegible]

NIGHT AT D[illegible] VILLA LONE [illegible]

9/24 LV LONE PINE 0[illegible]00 ARRIV
1100

52

9/27 LV RIV. 1030 – ARR
SAN LUCAS CYN 1630 HRS

9/28

MILEAGE.

20183.1 SAN LUCAS CYN RD AT ELLA MINE
NORTH ON SLC RD
83.25 RD TO LEFT TAKE IT
83.65 RD RETURNS SLC. RD [illegible] MINES [illegible]
THEN TAKES OFF AGAIN TO LEFT
TAKE LEFT FORK APPARENTLY OLD
ROUTE OF S.L.C. RD.
83.82 OLD JEEP RD TURNS OFF LEFT + CLIMBS
WEST [illegible] NOT TAKEN
83.75 REJOIN NEW SLC RD [illegible]
84.4 FORK TAKE [illegible] LEFT
84.5 OUTCROPS SIERRA [illegible] SIDE OF [illegible]
LT [illegible] MASSIVE [illegible]
84.6 TOP OF RIDGE [illegible] TRACK TO RIGHT
GOES BACK DOWN INTO SLC [illegible] SOME [illegible] TS
LOOK AT LATER. CONTINUE [illegible]
84.65 SIGN: INTERPACE CORPORATION
HOLIDAY TALC MINE
FOR INFORMATION CONTACT
INTERPACE CORPORATION
2901 LOS FELIZ BLVD.
LOS ANGELES CA 90039
TEL. (213) 663-3361
SIGN FAIRLY NEW – SLIGHTLY WEATHERED

(53)

SEVERAL [illegible] IN AREA. [illegible] TAKES OFF TO RT FROM SIGN. LOOK AT LATER

CONT. WEST

84.85 SIDE RD SOUTH OF [illegible]. LOOK [illegible]

CONT. WEST

85.1 HOLIDAY MINE PHOTO [illegible]

BROKEN [illegible] IN [illegible]

N OF [illegible] OPEN

TALC CUTS [illegible] TALC [illegible]

LOC [illegible]

BENCHES [illegible] LEVELS. [illegible]

TOP [illegible]

ROCK FILL [illegible]

AT [illegible] QUARTZITE. [illegible]

VERY [illegible] BY

FOUR [illegible] GROUND WATER. TALC BODIES

FORM [illegible] MASSES [illegible]

QTZITE PROBABLY ALONG FAULTS OR

FRACTURES.

[illegible] LEVEL FROM TOP [illegible] SIDE OF PIT ~30' BELOW TOP LEVEL. TALC BODY ~110' WIDE

SE END [illegible] QTZITE/TALC CONTACT OBSCURED BY SOIL BUT PROBABLY TRENDS NN-S. NW END CONTACT N-S 70E || BEDDING OF QTZITE. NW OF CONTACT

TALC BODY MUCH NARROWER ON 1&2 LEVELS

57)

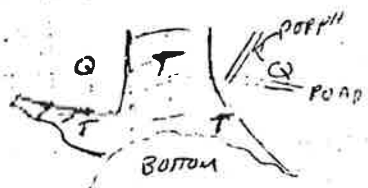
QTZITE LARGELY UNALTERED BUT
SOME LAYERS IMPREGNATED W
FINELY DISSEMINATED GRAY TALC -

4TH LEVEL ~ 20' BELOW 3RD [illegible]
SE END CONTACT N 45 55E
HANG WALL OF 1-2 MTR WHITE
CALICHE-LIKE → FINE GR. [illegible]
AN ALTERATION PRODUCT (MAGNES[illegible]
RD ON 4TH LEVEL
TALC BODY ~ 85' WIDE
NW CONTACT N 5W 70E. DISSEM
TALC IN SOME QTZITE LAYERS NEAR
CONTACT
35' NW OF CONTACT ANDESITE
PORPH DIKE CUTS QTZITE. DIKE
1 MTR WIDE AT TOP OF [illegible]
TO 3 MTRS ~~AT~~ BOTTOM OF [illegible]
3 MTRS LOWER. [illegible]
GROUNDMASS OF FERRUGINOUS. ~~CLAY~~ +
SILICEOUS. CLAY (ALTERED) W PHENOCRYSTS
ALTERED (CLAY) WHITE FELDSPAR 1-4MM
~ 15%. DIKE TRENDS N64E VERT

BOTTOM OF PIT TALC BODY ~ 180' WIDE
MEASURED ON LINE N80W
WESTERN CONTACT HAS SWUNG AROUND
TO N40W ACCOUNTING FOR MOST
OF INCREASE IN WIDTH.
→

55

EAST SIDE ~~[illegible]~~ N-S TRENDING BODY INTERSECTS WITH 2ND BODY TRENDING S 70 E VERTICAL [illegible]
BODY IS ~ 50' WIDE AT BOTTOM NARROWING TO ~ 15' AT TOP OF 6TH LEVEL ~ 100' EAST
WEDGE OF QTZITE NE CORNER OF PIT SEPARATES 2 BODIES



DESCRIPTION OF TALC:
MED TO DK GRAY, FINE GR[illegible]. LACKS FOLIATION OR OTHER PREFERRED ORIENTATIONS OF GRAINS, MOST CAN BE SCRATCHED WITH FINGERNAIL PRODUCING WHITE OR LT GRAY POWDER W HAS SOAPY FEEL - LITTLE FRICTION WHEN RUBBED BTWN FINGERS. NEAR CONTACTS TALC IS HARDER & GRITTIER W SILICA + OTHER IMPURITIES. BEST TALC AT BOTTOM MED GRAY CUT BY IRREGULAR SEAMS OF WHITE TALC & CALCITE. SOME ANGULAR MASSES 10 - 50 CM LONG BLACK MATERIAL - GRITTY, HARDER THAN FINGER NAIL - EMBEDDED IN GRAY TALC OR FORMS LAYERS OF IMPURE TALC.

MUCH OF TALC HAS FRAGMENTAL TEXTURE WITH ANGULAR CHIPS 1-10cm LONG OF BLACK TALC EMBEDDED IN GRAY TALC. SOME BLACK TALC IS SOFT & SOAPY, OTHER HARD & GRITTY.

SAMPLE S 0156 BOTTOM OF PIT
PICTURES S 0158 SHOW PIT & TALC STRUCTURES

SEE NOTE PAGE 60

LOC 3B PHOTO 10-517
½ MILE SW ON RD UP DRAW FROM HOLIDAY MINE.
CABIN PARTLY RUINED. MAGAZINES FROM 1959 INSIDE.
SHAFT INCL. 73° S 15E ~40' DEEP
ADIT ~30' SW OF SHAFT. S15E AT LEAST 20' LONG

PHOTO S 0156 FROM NORTH

SHAFT HAS 20' HEAD FRAME

~100' S OF SHAFT & ADIT 3 BENCHES TREND N65E EACH ~200' LONG
TOTAL VERTICAL DIST. EXPOSED ~40'

→

57

LOWER BENCH ~190' OF EXPOSURE OF GRAY TALC IN EUREKA QTZITE (?) TALC IS HORIZONTALLY LAYERED & BOUNDED BY FAULT AT NE END

MIDDLE BENCH ~~TALC~~ TALC EXPOSED DISCONTINUOUSLY OVER DIST. 150' AGAIN HORIZONTALLY LAYERED. BUT W BODIES OF QTZITE SEPARATING 3 BODIES OF TALC. ALSO FAULTED AT NE END.

UPPER BENCH: TALC EXPOSED IN ONLY FEW PLACES OVER DIST. 150'

SLOPE THAT ABUTS AGAINST SW END OF BENCHES IS HIDDEN VALLEY DOLOMITE. MERRIAM MAPS A FAULT SEPARATING HV DOL & EUREKA QTZITE. AT SW END OF UPPER BENCH HV DOL EXPOSED W NO FAULT VISIBLE. MAY BE A DEPOSITIONAL CONTACT AT THIS LOCALITY ?

TALC IS GRAY & BLACK & SIMILAR TO HOLIDAY MINE BUT LOWER GRADE. VERY LITTLE HAS SOFT SOAPY FEEL, MOST OF IT IS HARDER, GRITTIER & MORE BRITTLE. MUCH OF IT IS MIXED WITH A

FINE WHITE TO LIGHT GRAY POWDER THAT FIZZES MODERATELY IN COLD DILUTE HCl. MAY CONTAIN MAGNESITE.

Sept 29
RETURN TO HOLIDAY MINE.
LOC. 34. PHOTO 10-5??
~ 200 MTRS S 60 W FROM HOLIDAY
PROSPECT ~ 5' X 5' X 8' DEEP.
COUNTRY RK IS HIGHLY SHATTERED
EUREKA QTZITE(?) [illegible] THIN
ZONES OF TAN CLAY GOUGE
ALONG SHEARS. SOME FRACTURES
FILLED BY SECONDARY MILKY QTZ
VNS (FINE GR, MASSIVE, NO
MNRLZATION). IN PROSPECT VN OF
GRAY TALC ~ 80cm WIDE N5E,
67W. TALC HIGHLY SHEARED &
BROKEN UP INTO 1-3cm LONG
FRAGMENTS. TALC IS SOFT &
SOAPY BUT ADMIXED W LOT OF
CALCITE IN THIN STRINGERS. IN
QTZITE ON FOOTWALL SIDE SEVERAL
DIKELETS OF BLACK FINE GR. [illegible]
BASALT PENETRATE FRACTURES.

57

IN SEVERAL DIRECTIONS. NO [illegible]
IN HANG WALL SIDE. NOT
ENOUGH TALC + TOO MUCH [illegible]ICITE
TO BE ECONOMIC.

~85' UPHILL FROM PROSPECT
CONTACT EUREKA QTZITE(?) - [illegible]
VALLEY DOLOMITE. BOTH QTZITE &
DOL. HIGHLY FRACTURED. CONTACT
NOT EXPOSED BUT CAN LOCATE WITHIN
10 FEET. CONTACT TRENDING 30E
& DIPS NW. BASED ON RELN. TREND OF
CONTACT TO TOPO. MERRIAM MAPS
THIS CONTACT AS A FAULT. CANNOT
GET BEDDING ATTITUDES ON QTZITE
OR DOL BUT SHATTERING SUGGESTS
FAULT

TAKE RD SW FROM HOLIDAY, TAKE 1T
FORK UP DRAW N. OF LOC 33.

LOC 35 PHOTO 10-5[illegible]
POST BY ROAD W METAL TAG
"JUDY NO 1 NW CORNER
OLD TIMER SW CORNER"

→

(60)

JUDY #1 WEST OF ROAD
COUNTRY RK IS HIDDEN VALLEY DOLOMITE
2 ADITS LOWER ONE N73W ~15 MTRS
UPPER ADIT N6E ~10 MTRS
UPPER ~ 20M S50W FROM LOWER

BOTH ADITS DRIVEN INTO MIXTURE
GRAY TALC FRAGMENTS 1-5cm LONG
IN WHITE FINE GR CALCAREOUS MATERIAL
(~40% TALC FRAGS) ALSO EMBEDDED
ARE ANGULAR CHIPS & BLOCKS OF
DOLOMITE & LOCALLY A "BRECCIA" OF
DOLOMITE & TALC CEMENTED BY TAN TO
SLIGHTLY PINKISH QUARTZITE. SUGGEST
TALC & QUARTZITE ARE OF HYDROTHERMAL
REPLACEMENT ORIGIN. PAGE (1951, CDMG
SPEC. REP 8) SAYS MOST TALC BODIES
IN AREA ASSOC W QTZITE-LOOKING
ROCK W IS OF HYDROTHERMAL ORIGIN.
RAISES QUESTION HOW MUCH OF
QTZITE MAPPED AS EUREKA BY
MERRIAM AT HOLIDAY AREA IS
REALLY EUREKA?

NOTE ON LOC 33, PAGE 56
FROM THIS VANTAGE POINT CAN SEE ENTIRE
AREA OF BENCHES LIES WITHIN H.V.
DOL. CONTACT W QTZITE ABOUT
200-300' NE OF NE END OF BENCHES

(61)

CONTACT VERT & TRENDS ~ N20W
MOST LIKELY A FAULT. QTZITE ASSOC W
TALC MAY BE REPLACEMENT.

LOC 36 PHOTO 10-517
~ 200 YDS N48E FROM LOC 35
POST W METAL TAGS: "OLD TIMER" CL SOUTH. JUDY No 1 CL NORTH."
NEXT TO POST SHAFT INCL. 70° N65E
~ 60' DEEP. ENTRY IN HIDDEN
VALLEY DOL. AT PORTAL QTZ VN.
3-5 CM THICK STRIKES N25W
70 NE. SHAFT DOWN DIP OF VN
THIS ALSO ATTITUDE OF BEDDING
FRAGMENTS ON DUMP INDICATE VN
AS WIDE AS 10 CM. IN ANASTAMOSING
PATTERN OF THINNER VEINLETS W
"ISLANDS" OF DOL. IN BETWEEN. FRAGMENTS
IN DUMP CARRY MALACHITE + MINOR
AMOUNTS OF AZURITE (OR LINARITE?)
IN IRREGULAR POCKETS UP TO .CM LONG.
ALSO SOME MINOR CHALCOCITE + REMNANTS OF
GALENA (?) + PYRITE.

FINE GR. MASSIVE MILKY QTZ

~ 200' N25W FROM SHAFT. PROSPECT
~ 15' x 6' x 3' DEEP. QTZ VN ~ 10 CM
WIDE N35E 65 NW. CONTAINS
POCKETS CELLULAR RED HEM &
LT BROWN GOETHITE. NO OTHER MNRLZATN.

(62)

ROAD CONTINUES N FROM JUDY + LINKS UP WITH ROADS FROM BONHAM CYN. SEVERAL MINES + PROSPECTS IN NEXT DRAINAGE NORTH W CAN BEST BE VISITED VIA BONHAM CYN. NO

RETURN TO HOLIDAY MINE

LOC 37 PHOTO 10-517
~1/4 MI SSW FROM HOLIDAY STOCK PILE AT END OF ROAD UP DRAW
BULLDOZER CUT ~20'x20'x15' HIGH IN EUREKA QTZITE. GOOD QUAL. TALC SOFT + SOAPY + FREE OF IMPURITIES TEXTURE OF WHITE TALC XLS UPTO 1CM LONG EMBEDDED IN FINE-GR GRAY TALC GIVING A "PORPHYRITIC" LOOK. SIDES OF CUT COVERED W RUBBLE + CAN'T TELL SIZE + SHAPE OR STRUCTURAL RELATIONS OF TALC BODY.

SAMPLE S-0162

LOC 38 ~ 500' S OF LOC 37
RAINING ADIT SSSE AT LEAST 30' LONG IN EUREKA QTZITE SOME GRAY TALC DISSEM. IN QTZITE BUT NO HIGH GRADE STUFF.

63

9/30 DROVE DOWN SAN LUCAS CYN & UP BONHAM CYN TO WHITE MTN TALC MINE. RECONNED AREA. FIGURE 3 MAN DAYS FOR WHITE MTN & FLORENCE MINES. 1 DAY FOR UPPER BONHAM CYN PLUTON & 1½ DAYS FOR AREA BTWN JUDY MINE & BONHAM CYN. ROADS ARE VERY BAD - 1¼ HOURS ELLA TO WHITE MTN MINE. ROAD NORTH FROM JUDY MINE DOES NOT CONNECT TO BONHAM CYN

NIGHT IN LONE PINE

10/1
LV LONE PINE 0900 ARR [illegible] 1400

NOTE: AREA BTWN HOLIDAY MINE & SAN LUCAS CYN MOSTLY QTZITE WITH "TONGUES" (?) OF HIDDEN VALLEY DOLOMITE PENETRATING IT. SEVERAL CUTS EXPOSING SMALL TALC BODIES. AREA MUCH MORE COMPLEX THAN MAPPED BY MERRIAM. POSSIBLE THAT SOME OR ALL OF SO-CALLED EUREKA QTZITE MAY BE HYDROTHERMAL REPLACEMENT. REQUIRES DETAILED MAPPING

10/4 LV RIV 1100 ARR
SAN LUCAS 1700

10/5
20643.9 SADDLE AT CERRO GORDO TAKE LOW ROAD NORTH TO NEW YORK BUTTE. (WITH McFARLAND)

46.95 SWITCHBACKS
LOC. 1 PHOTO 9-556
OLD TRAIL NEARLY OBLITERATED TAKES OFF TO WEST AT LEAST ½ MILE. REST SPRINGS (=CHAINMAN) SHALE. ATT. BEDDING N50W 65SW
SHALE CUT BY NUMEROUS VNS OF WHITE TO GRAY COARSELY XLN CALCITE 1-2cm WIDE FILLING JOINTS.
ALSO SOME DEPOSITS OF CONCRETIONARY CARBONATE RESEMBLING TRAVERTINE. RADIATING ~~NEE~~ NEEDLE LIKE XLS SUGGEST POSSIBLY ARAGONITE. NO PROSPECTS OR MINERALIZATION.
BOULDERS OF MED GRAIN DK GRAY GRANODIORITE (?) ON SURFACE SOURCE UNKNOWN

BLOCKS OF "TRAVERTINE" COMMON THROUGHOUT REGION.

48.0 CERRO GORDO SPRINGS AREA
LOC. 2 PHOTO 9-556
→

65

BELSHAW PUMPHOUSE CONTAINS REMAINS OF PUMPING MACHINERY + TANKS IN CORRUGATED METAL SHACK. WATER ON SUPP. FROM SPRING ~100' SW OF SHACK SPRING IS IN REST SPRING SHALE ON FAULT COMING UP FROM BUNHAM CYN ~ N70W

NE OF SHACK TIN MTN ~ 50' THICK THINS RAPIDLY TO SOUTH. SOUTH OF DRAINAGE INTO BUNHAM CYN TIN MTN GONE — REST SPRING SH. LYING DIRECTLY ON LOST BURRO. ATTITUDE ON TIN MTN N13W 39SW

VEGETATION AROUND SPRING ABUND. RABBIT BRUSH, MORMON TEA + GREAT BASIN RYE GRASS AS WELL AS PINION + SAGE. 2 DECIDUOUS TREES NEAR HOUSE

BEHIND PUMPHOUSE LIMONITE STAINED SHEAR ZN IN REST SPRINGS SH N30W

SW OF PUMPHOUSE ZN OF INTENSE BRECCIATION + SILICIFICATION ~ 100' WIDE TRENDS N80W. SILICIFICATION

TRANSFORMED SHALE INTO VER- HARD.
DENSE DK GRAY RK. SPRING APPEARS TO
BE ON INTERSECT N30W + N30W FAULTING

48.[illegible] RD TO NE ~ ¼ MI TO MEXICAN SPRING

CAMP ~ ½ MI SE OF SUMMIT TRAM STATION

OCT 6

MILEAGE

20650.7 SUMMIT SALT TRAM STATION 3 PICTURES
COUNTRY ROCK IS LT GRAY PORPHYRY
W WHITE ALTERED FELDSPAR
PHENOCRYSTS UP TO 5 mm (~ 10%) +
ALTERED BIOTITE [illegible] UP TO 4 mm
(~ 2%) IN V FINE GR. ALTERED
GROUNDMASS

SMALL BODIES INTRUSIVE RK THROUGHOUT AREA UNMAPPED BY MERRIAM

51.9 OUTCROP DK GRAY FINE GRAIN RK
QUITE SOFT, CALCAREOUS (ARGILLACEOUS
ls.) EITHER MERRIAM'S <u>[illegible] VALLEY</u>
<u>FM</u> OR HIS TRIASSIC MARINE

LOC W FLANK HILL 8677

52.1 LS + SH
52.2 OUTCROP INTRUSIVE PORPHYRY. FINE
GR LT BROWN GROUNDMASS. [illegible]
FELDSPAR UP TO 5 mm (~ 15%).
BIOTITE UP TO 3 mm (~ 2%).
MONZONITE PORPHYRY (?)

52.4 OUTCROP LT BROWN CALCAREOUS SS
THIN BEDDED (½-5CM) ATT N40W 47SW
VNS OF CRSLY XLN MILKY QTZ ~1CM
THICK ALONG BEDDING PLANES 20-30
CM APART. LOC APROX CONTACT
TR MARINE OF MERRIAM

BURGESS MINE LOC 1 PHOTO 6-657
METAL MINE SHACK AT HEAD OF
CRAIG CYN. COUNTRY ROCK IS
TRIASSIC MARINE LS. (GRAY, [illegible], MASSIVE)
NEXT TO SHACK SHAFT INCL ~43° S70W
SHAFT BACKFILLED + [illegible].
FROM DUMP SHAFT WAS IN LS +
KAOLINIZED QTZ MONZONITE. QTZ VN
PROBABLY AT LEAST 15CM WIDE BUT
PROBABLY WIDER. VN IS COARSLY XLN
MILKY AND [illegible] QTZ. ALSO FINER GR.
MILKY QTZ WITH GREASY LUSTER BECOMING
SLIGHTLY SMOKY ALONG THIN BANDS.
QTZ CONTAINS POCKETS OF [illegible] 1-5CM
LONG HAVING IRREGULAR SHAPE + SOME
SCATTERED GALENA [illegible] UP TO 5MM.
QTZ CONTAINS ABUNDANT BROWN REDDISH
BROWN + YELLOW BROWN FEOX IN IRREGULAR
MASSES + BANDS THROUGHOUT QTZ. FEOX
~20% OF VN. QTZ [illegible] FRACTURED
→

ER

WITH THIN BEARS FROST ALONG CREEKS,
YELLOW FLOW [illegible] [illegible] TEXTURES
[illegible] RED BROWN [illegible] [illegible]
[illegible] [illegible], [illegible] [illegible]
[illegible] [illegible] SOMEWHAT - GOOD [illegible]
IN [illegible] [illegible] [illegible] [illegible]. [illegible]
LINE OF SHALLOW PROSPECTS EXTEND
[illegible] [illegible] [illegible] ~ 200 FT. SOME
OF THESE HAVE SIMILAR LOOKING
OTZ AROUND THEM BUT AU NOT
VISIBLE WRITE & ASSUME [illegible]
STRIKES N80W & DIPS MODERATELY SW
SAMPLES E 0162

LOC 2 PHOTO 6-057
~200 YDS N 70 E FROM [illegible] SAMPLE
LOC 1.
ADIT IN [illegible] [illegible] [illegible]
LAYERS OF BROWN [illegible] [illegible] [illegible]
SPACED 10-30 [illegible] [illegible] [illegible] [illegible]
& STRETCH ALONG [illegible] [illegible] N80W 50 SW

ADIT N30W [illegible] [illegible] [illegible]
[illegible] WHITE LAYER, [illegible] [illegible]
[illegible] [illegible] 30 cm [illegible] N70W [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
SOME [illegible] EXCAVATIONS NEAR [illegible]
BUT NOT A [illegible] [illegible] VERY [illegible]

[illegible] [illegible] [illegible] [illegible]

(69)

WITH LS PROTRUDING INTO OR
THROUGH VN & NUMEROUS "ISLANDS"
OF LS 1-15 cm LONG WITHIN QTZ.
INDICATES REPLACEMENT VN.
ALSO AT PORTAL BRECCIA ZONE IN
LS ~ 30 cm WIDE N75W 55NE
INTERSECTS VN ABOVE PORTAL

~60' NE OF ADIT SILICIFIED APLITE
SILL IN LS ~5' THK N37W 90

LOCS 3, 4, 5 PHOTO 6-659
SEE BOOK 2 (MACFARLAND) PP 1+2

BURGESS MINE APPARENTLY ON MAJOR
TOPO LINEAMENT TRENDING N30W
MARKED BY ALIGNMENT OF
APLITE & QTZ MONZ. DIKES & VNS.
MANY DIKES SILICIFIED. IN FACT
WHOLE AREA SEEMS TO BE ZONE
OF SILICIFICATION. POSSIBILITY
OF A DISSEMINATED ORE BODY.

(70)

10/7
WORKING ON FOOT NW UP ROAD. FROM MINE SHACK AT BURGESS MINE

LOC 1 PHOTO 6-660
200 YDS NW OF SHACK
PROSPECT ~20' DEEP + 10' WIDE NEXT TO ROAD
FINE GRAIN, LT GRAY SILICEOUS RK, SOME W. MASSES OF FINE GRAIN CINNAMON BRWN GARNETIFEROUS MATERIAL. ALSO MED GRAIN, LT GRAY KAOLINIZED QTZ-MONZONITE (?)
EXPOSURE POOR IN PIT BUT. QM SEEMS TO BE A DIKE TRENDING S40E DIRECTLY TOWARD BURGESS MINE. NO MINERALIZATION EVIDENT.

LOC 2 200 YDS N OF BURGESS ON SLOPE EAST OF LOC 1.
3 PROSPECTS IN TRIANGLE

a. SW PROSPECT ~200' E OF LOC 1
PROSPECT ~ 20' x 15' x 6' DEEP.
LT. GRAY + BROWN SILICEOUS + GARNETIFEROUS FINE GR. RK CUT BY FEW THIN SEAMS (2 mm) GLASSY QTZ. NO MINERALIZATION. SOME YELW BRWN LIMONITE CRUSTS

b. 120' NE OF a. PROSPECT
APPROX 15' x 8' x 5' DEEP. IN GRAY

(71)

LS. QTZ VN ~ 20cm THK CUTS LS
N10W 62SW. WHITE CRSLY XLN MLKY QTZ
PEARLY LUSTER → VUGGY. SOME THIN YELW BRWN LIMONITE
COATINGS ON FRACT. SURFACES. VN HIGHLY
FRACTURED ALONG WALLS. LS SILICIFIED
NEAR WALLS. QTZ CONTAINS SCATTERED
XLS OXIDIZED PYRITE (1-2mm) < 1%)
OTHERWISE BARREN. SAME VN AS
DESCRIBED AT ADIT p 68 (LOC 2, PHOTO 6-659)
ADIT ~ 200' NW.

C. 200' N20W FROM b. VERT. SHAFT ~
10' ACROSS & AT LEAST 20' DEEP (PARTLY CAVED)
KAOLINIZED QTZ MONZ DIKE MINIMUM 2' THK
N40W 50NE CUTTING GRAY VERY FINE
GRAIN SILICIC RK. NON-CALCAREOUS.
LATTER RK TYPE HAS ABUNDANT (UP TO 5%)
PYRITE IN SMALL XLS ≤ 1mm DISSEM THROUGH
IT OR CONCENTRATED IN THIN SEAMS.
NO OTHER MINERALIZATION. WEATHERING
OF PYRITE GIVES DRAB GREEN COLOR ON
EXPOSED SURFACES.

200' NW OF C. MARKER. "NE COR. BURGESS"
MARKED CM ON PHOTO 6-660

ALSO CENTER LINE MARKER NEXT TO RD MARKED
CL ON PHOTO →

LOC 3 ~ 300 YDS N 60 W FROM MINE SHAFT
3 CUTS IN BANK EACH ~10' LONG &
6' DEEP EXPOSES SCARN OF MED GR
CINAMON BROWN GROSSULARITE GARNET
(~70%) + GREEN EPIDOTE (?) OR DIOPSIDE (?)
(~20%) MOST OF IT HIGHLY OXIDIZED
FORMING CRUSTS OF SCALY LIMONITE &
~~[illegible]~~ DK GRAY SUBMETALLIC GOETHITE.
NO SULFIDES OR ECONOMIC MNRLS SEEN
SAMPLE S0172 (2)
SCARN CAN BE TRACED ~ 75 YDS NW
KNOLL ~ 150 YDS NW MASSIVE DK GRAY
FINE GR ROCK ~60% MAFIC & 40%
WHITE FELDSPAR IN SALT & PEPPER TEXTURE
PROBABLY AMPHIBOLITIC

LOC 4 ~ 2000'N OF BURGESS SE CORNER
VALLEY E OF NEW YORK BUTTE
2 PROSPECTS ~ 100' APART.
SW PROSPECT EXPOSES GROSSULARITE
SCARN SIMILAR TO LOC 3 BUT COARSER GR.
SCARN CUT BY 5 CM WIDE MILKY QTZ VN
WHITE, PEARLY, CRSLY XLN, VUGGY. NO
MINERALIZATION
NE PROSPECT EXPOSES SCARN, GRANULAR
AMPHIBOLITE + WHITE SLIGHTLY KAOLINIZED
QTZ MONZ. CONTACT ~ N 45 W
RELATIONS SCARN + AMPHIBOLITE CAN'T
→

73

BE SEEN. NO QTZ VN OR MINERALIZATION.

LOC 5 2 PROSPECTS ~ 300 YDS NW OF LOC 1.
SE PROSPECT AN. ADIT INCLINED 40° N50E
AT PORTAL BANDED LT GRAY & BROWN
SHALE. NO PHYLLITIC SHEEN ON PARTINGS
SOFT & CRUMBLY LAYERING N5E 90°
ALSO SOME GRANULAR AMPHIBOLITE & LT GRAY V.
FINE GRAIN SILICEOUS RK. NO QTZ
VN OR MINERALIZATION.

UPHILL TO NE OUTCROPS GRAY
~~CS~~ COURSLY XLN LS. GR. SIZE ~ 2mm

150' NW 2ND ADIT N65E HORIZ.
AT LEAST 50' LONG.
ON DUMP BLOCKS DK GRAY & WHITE BANDED
SACCAROIDAL XLN LS & SOME PURE WHITE
XLN LS. ALSO DK GREENISH BROWN
GARNET-DIOPSIDE(?) CALCITE SCARNS CONTAIN
& EPIDOTE SEAMS OF CHRYSOCOLLA & MALACHITE
1-3mm THICK. SCARN ALSO CONTAINS
MAGNETITE

LOC 6 PHOTO 6-660 SE CORNER NEW YORK
BUTTE. QTZ. MONZ GRAY, MED GR.
KSPAR 35, PLAG 30, HBL+BIOT ~~15~~ 20, QTZ 15
PLAG IN RECTANGULAR LATHS UP TO 4mm,

(74)

~4mm?
KSPAR IN MORE EQUANT XLS. QTZ
INTERSITIAL ~1mm. HBL & BIOT (HBL SLIGHTLY
PREDOMINANT) IN SCATTERED CLOTS
THROUGHOUT ROCK. ROCK FAIRLY
UNIFORM, THE ONLY VARIATION IN
MAFIC CONTENT. ONE VARIANT BIOT ~
2%, HBL ABSENT, QTZ ~15% & FELDSPARS
~ =. KSPAR PINK. OTHERWISE GRAY
HBL-BIOT. QTZ MONZONITE.
ROCK VERY FRESH - RESISTS WEATHERING
SAMPLE S0179 ~ INTERMEDIATE BTWN TWO
TYPES DESCRIBED

LOC 7 . 6-660 SW CORNER NEW YORK
BUTTE SHAFT INCL 50° N20E DOWN
DIP OF 1 FT WIDE QTZ VN. ~20' DEEP
COURSLY XLN, MILKY, GREASY LUSTER. HIGHLY
FRACTURED WITH THIN SEAMS OF BROWN
FeOX ALONG CRACKS. FeOX MAY CARRY
GOLD. ?

QTZ MONZ MORE MAFIC THAN LOC 6
GREEN HORNBLENDE PREDOMINATING UP TO
30%. ALSO COARSER GR THAN LOC. 6
OTHERWISE REL. PROPORTIONS OF MNRLS
& BASIC TEXTURE SAME.

75

10/8 LV INYO MTNS 0830 ARR. RIV. 1730

10/11 – 10/15 • OFFICE

10/18 LV RIVERSIDE 1130 – ARR. LONE PINE, 1715. NIGHT IN DOW VILLA LONE PINE.

10/19 LV LONE PINE 0930 – ARR. SAN LUCAS TRAILER 1045

MET DUSTY AT ELLA MINE (PAUL PAYNE'S PARTNER) THEY HAVE ALSO FILED ON THE SAN LUCAS MINE. WHICH IS JUST OVER RIDGE EAST OF ELLA. HIKED WITH HIM TO THAT MINE. APPEARS TO BE ON SAME VN SYSTEM AS ELLA - GALENA IN. ~~QTZ~~ MILKY QTZ VN. PROBABLY CARRYING SOME SILVER. WANT TO BUILD RD. TO SAN LUCAS ALONG RT OF OLD PACK TRAIL FROM NEWTOWN MINE. TOLD HIM TO CONSULT WITH MCFARLAND.

REMAINDER OF AFTERNOON IN TRAILER

NOTE: FRONT END LOADER AT HOLIDAY MINE NOT THERE 9/29 HAS MOVED SOME ORE FROM STOCK PILE

10/20 DRIVE TO JUDY & OLD TIMER CLAIMS NW OF HOLIDAY MINE (SEE P 59)

21/30.3
30.6
SADDLE NORTH ACROSS DRAW RIDGE TOP OVERLOOKING BONHAM CYN
SUBDUED OUTCROPS OF GRAY MONZONITE PORPHYRY (?) W PHENOCRYSTS CREAM COLORED FELDSPAR (MOSTLY K-SPAR) UP TO 4 MM (~20%) & HBL UP TO 4MM (~10%) IN GRAY FINE GR. GROUND MASS. INTRUDES LT GRAY SACCAROIDAL HIDDEN VALLEY DOLOMITE CONTACTS NOT EXPOSED & TREND OF BODY NOT EASILY DISTINGUISHED.

TRACTOR TRAILS TAKE OFF NW, SW & SSE FROM RIDGE TOP. TRAIL NW ~¼ MILE ENDS. ABANDONED D-4 CAT AT END. PROBABLY INTENDED TO CUT RD THROUGH TO BONHAM CYN. AT RIDGE TOP ABANDONED COMPRESSOR, PILES OF LUMBER & LOT OF JUNK. "1974" PAINTED ON RK.

LOC 1 PHOTO 10-516

2 PROSPECTS ~ 150' N OF Rd. AT RIDGETOP UPPER PROSPECT. ADIT ~ 2M LONG INTERSECTS BRECCIA ZONE ~ 1M WIDE IN HIDDEN VALLEY DOLOMITE →

(77)

ATT. N65E55 NW. SCATTERED POCKETS MALACHITE UP TO 10cm LONG IN BRECCIA. BRECCIA A.18 LAR FRAGS 1–3CM LONG IN RXLIZED CALCITE MATRIX. SOME CALCITE BOXWORKS

LOWER PROSPECT ~ 12M N60W FROM UPPER

ADIT S40E ~10M LONG SOME VUGGY MILKY QTZ & TRACES OF MALACHITE AT PORTAL BUT NONE SEEN INSIDE. QTZ IN IRREGULAR BRANCHING VNS – PROB. REPLACEMENT

LODE LOCATION MONUMENT "JUPITER 1970 LOCATION MONUMENT" D.L.

NOTICE OF LOCATION:
JUPITER TALC 1975
CLAIMS 1000' EASTERLY & 500' WESTERLY
LOCATOR. DELBERT LEONARD NO ADDRESS

LOC 2 PHOTO 10-516
~¼ MI W OF LOC 1 ON EAST FACING SLOPE JUST BELOW RIDGETOP. 2 PROSPECTS. IN HIDDEN VALLEY DOLOMITE
UPPER PROSPECT SHAFT INCL 60° N70E CAVED SHAFT DOWN DIP OF VN OF QTZ ~30cm WIDE. MED GR GLASSY TO SLIGHTLY MILKY QTZ. VUGGY W WELL –
→

(78)

FORMED EUHEDRAL XLS. VERY RICH IN
MALACHITE IN POCKETS UP TO 10cm LONG.
MALACHITE SURROUNDS REMNANTS OF
GRAY CHALCOCITE UP TO 1cm DIAM.
EST ~ 5% TO 10% Cu MNRLS. ALSO
MINOR AZURITE + BRIGHT YLLW-GRN FINELY XLN
MNRL FORMING ENCRUSTATIONS ON QTZ
LOOKS LIKE VANADINITE (?). SCATTERED
XLS GALENA (½ cm, ~1-2%) ALSO COMMON

No Feux

→ SAMPLE S-0177 (2)

LOWER PROSPECT ~ 150' SE OF UPPER
2 INCLINED SHAFTS FROM SAME COLLAR
1. 55° DUE NORTH
2. 60° DUE WEST
MNRLZATION LIKE UPPER ADIT. QTZ
MORE MILKY
VN ~ 40cm WIDE N20W 55 NE
SAME VN AS UPPER PROSPECT

LOC 3 PHOTO 10-516
~1/4 MI SE OF LOC 1 SMALL CUT
IN HILLSIDE EXPOSES SMALL BODY OF
TALC IN H.V. DOL. FINE GRAIN, GRAY
SOAPY - NOT GRITTY. CUT IN OVERBURDEN
NO BEDROCK EXPOSED SO CAN'T TELL
CONTACT RELATIONS

→

(79)

THIS LOC ON EDGE OF LINEAR VALLEY
W LINES UP W NOTCH IN RIDGE
TO N & WITH TREND OF SAN
LUCAS CYN FAULT

10/21

132.4 JCT BOTTOM SAN LUCAS CYN N TOWARD
LEE FLAT
21 146.0 TAKE RD SOUTH
RD CLIMBS TO TOP OF NELSON RANGE
PAST SEVERAL MINES
50.8 END OF RD Cu PROSPECTS IN LS
INTRUDED BY QTZ MONZ.

NIGHT IN DOW VILLA LONE PINE

10/22 LV LONE PINE 0900 ARR
RIV 1430

10/24 LV RIV 1115 ARR SAN LUCAS
1630
10/25 HELICOPTER PICKUP 1000
DROP OFF NE FLANK KEYNOT
PEAK.
OUTCROPS GRAY MSD GR EQUIGRANULAR
QTZ MONZ ~ 75% FELDSPAR (~ = PINKISH →

(80)

K SPAR + WHITE PLAG) 5% BIOTITE + 20%
INTERSTITIAL QTZ. CARRIES ANGULAR GRANULAR
BLOCKS FINE GR BLACK AMPHIBOLITE
HBL-BIOT-SPAR-QTZ W SOME SECONDARY
EPIDOTE. TRAVERSE E NE ALONG RIDGE

LOC 1 - PHOTO 6-664
KEYNOT MINE
DISC. MONUMENT W METAL SIGN
"KEYSTONE #1
ASSESSMENT WORK DONE 1966 + 1967
F + B COMAN"
. INSIDE ADIT IS NOTICE
"KEYSTONE #1 GENERAL COURSE
OF VN EASTERLY + WESTERLY
1500' X 600'
KEYSTONE #2 "NORTHERLY + SOUTHERLY
1500' X 600'"
SIGNED D. LEONARD.
ADIT N50W ~800' LONG FOLLOWS
VN W DIPS ~ 10-20° SW
VN IS IN MED GRAIN QTZ MONZ
V. SIMILAR TO KEYNOT PEAK BUT
SLIGHTLY MORE MAFIC (10-20%
MAFIC INCLUDING HBL) VN ~ 2'
THICK + WALL ROCK LIMONITIZED
FOR DIST. SEVERAL FEET. NO OTHER
WALL RK ALTERATION.

(87)

VN VERY CRSLY XLN MILKY QTZ ~2' THICK. VUGGY W WELL FORMED QTZ XLS UP TO 3CM LONG. COMPACT LIMONITE IN VUGS & ALONG FRACTURES PYRITE & CHALCOPYRITE COMMON IN POCKETS & SCATTERED GRAINS UP TO 1CM. GRADE LESS THAN 10% MALACHITE & AZURITE VERY COMMON ALONG WALLS OF VN.

ALSO LIMONITE PSEUDOS AFTER PYRITE

REPORTED TO HAVE PRODUCED $500,000 GOLD

LOC 2 6-664
~200' NORTH OF 1
ADIT N 50 W ~ 10 METERS
ALONG STRIKE OF VN W DIPS 35SW VN ~ 1½ M THK
LIKE LOC 1 BUT LACKING Cu, PYRITE PRESENT BUT NOT AS ABUNDANT

ANOTHER PROSPECT ~ 200' WEST OF 2 & ONE ~ 400' SSE OF 2 NOTED ON PHOTO W RED DOTS. QTZ VNS SIMILAR TO 1+2

ANOTHER SIMILAR QTZ VN IN CANYON OVER RIDGE TO NE MARKED IN GRN ON PHOTO.
2 ADITS ON RDGE TO SOUTH ACROSS CYN. TRY TO GET TO TOMORROW

(82)

ON PAGE 79 ANOTHER PROSPECT ~200' N OF LOC 2
SIMILAR QTZ ABUND MALACHITE, PYRITE & CHALCOPYRITE (UP TO 1%)
SOME HEAVY RED. BROWN SPONGY FeOX COATINGS

10/26 VERY WINDY, NO COPTER FLIGHT. UNDERGROUND IN ELLA THEN DROVE TO LONE MINE TO MEET W JEAN.

10/27 WHITE MTN TALC MINE
BONHAM CYN
EXTENSIVE OPEN PIT OPERATIONS BOTH SIDES OF CYN MOSTLY ON S. SIDE. THIS AREA WELL MAPPED & DESCRIBED BY PAGE & WRIGHT (CAL. DIV MINES SPEC. REP. 8) & LITTLE I CAN DO TO IMPROVE ON THEIR WORK. BEST TALC AT UPPERMOST LEVEL IN OPEN CUTS (WHAT PAGE & WRIGHT CALL THE GLORY HOLE) HERE TALC IN ~ 20' THICK BAND N60E 35SE. MINERALIZATION ASSOC. WITH NW TRENDING FAULTS WITH A NW DIKE BTWN DIPPING ~40° NE. DIKE ~ 1M THK DK GRN ALTERED (CHLORITIC?) MATRIX W PHENOCRYSTS ALTERED FELDSPAR (UP TO 3MM ~ 15%) PROB. ANDESITE.
→

(63)

DESCRIPTION OF TALC? HIGHEST GRADE
WHITE TO PALE GRAY GREEN
MED. GRAIN GRANULAR TO
SLIGHTLY SCHISTOSE. ALSO SOME
MATERIAL PALE GREEN TALC + DK GRAY
MORE SILICEOUS TALC INTERGROWN FORMING
MOTTLED TEXTURE. EACH TYPE IN ANGULAR
MASSES ~ 1-2 cm.

ASSOC W. TALC IS CALCAREOUS QTZ RK
FRIABLE, SACCAROIDAL W ABUNT QTZ GRAINS ~ 1mm
IN CALCITE MATRIX. SOME QTZ RK
HARD + MASSIVE LACKING CALCITE
BUT STILL GRANULAR TEXTURE

SAMPLES (4) S0182

10/28/76
COPTER DROP OFF KEYNOT/BEVERIDGE RIDGE
LOC 3 PHOTO 6-664
~½ MI SE OF KEYSTONE (LOC 1) ON
S SIDE KEYNOT CYN JUST BELOW RIDGE TOP
ADIT S15W CAVED AT PORTAL.
METAL SIGN LIKE AT KEYSTONE
"MALLARD DUCK LOCATION MONUMENT
ASSESSMENT WORK DONE 1969-70
F + B COMAN 9/3/69

DUMP CONTAINS CHUNKS OF MILKY QTZ: CRSLY XLN, →

(367)

[illegible]

[illegible]

[illegible] PRESENT
[illegible]

[illegible]
ANOTHER [illegible]
[illegible]

[illegible]

85

LOC 5 PHOTO 6-664
BOTTOM KEYNOT CYN ~¼MI S.
OF KEYSTONE MINE
PROSPECT ON QTZ VN IN QTZ MONZ
~2M THK → VN N60W 55SW, CRSLY XLN
VUGGY MILKY QTZ. GREASY LUSTER
CONTAINS ABUND. POCKETS CELLULAR
FE OX (YLLW BROWN FLUFFY LIMONITE +
BLACK METALLIC GOETHITE /HEMATITE)
1-3cm. CUBIC MOLDS OF PYRITE XLS
FORM BOXWORK IN FEOX. QTZ FRACTURED
W YLLW-BROWN + RED-BROWN FE OX ALONG
CRACKS. PROBABLY CARRIES GOLD.
QTZ. MONZ. LIKE THAT DESCRIBED
ABOVE. SERICITIZED + SLIGHTLY
ARGILLIZED ALONG WALLS OF VN
LOCALLY HEAVILY ALTERED TO EPIDOTE

LOC 6 BOTTOM OF DRAW ¼MI SW OF
KEYSTONE. OLD SHACK W. MAGAZINES FROM
30'S + PRINTED ENVELOPES W RETURN ADDRESS
"INDEPENDENCE MINING CO. BOX 56 INDEPENDENCE"
SHAFT > 50' DEEP INCLINED 70° N50W
DOWN DIP OF QTZ VN (I.E. STRIKE N40E)
DUMP CONTAINS CRSLY XLN MILKY QTZ
VUGGY, GREASY, W SCATTERED POCKETS
OF INTERGROWN 1mm PYRITE XLS, MUCH
OF DUMP IS FEOX GOSSAN — BLACK

(86)

CRYPTOCRYSTALLINE GOETHITE + CELLULAR YLLW-BRWN LIMONITE. FEW SCRAPS OF MALACHITE ON DUMP. PROBABLY GOLD. VN. CROPS OUT BEHIND SHACK ~1M THK. WALL ROCK HIGHLY ARGILLIZED + SERICITIZED IN ZONE ~2' THK

10/29 WITH MCFARLAND
HELICOPTER DROP OFF IN BEVERIDGE CYN
LOC 1 PHOTO 6-663 ~150 YDS. S. OF OLD CABIN
ADIT S20E ON QTZ VN 2M WIDE AT PORTAL
VN N20W 75NE IN QTZ MONZ
ADIT GOES IN 10M JOGS SW 2½ M THEN S20E 6 M. VN ~4M THICK AT JOG.

QTZ CRSLY XLN MILKY QTZ GRADING TO SMOKY QTZ IN PATCHES. VN VUGGY NEAR WALLS W WELL-FORMED QTZ XLS 1-2cm LONG. LARGE VUG ALONG FOOT WALL ~8-10' LONG ∥ WALL LINED W EARTHY HEMATITE + QTZ XLS. MIDDLE OF VN MORE MASSIVE, GRANULAR, MED GR.
QTZ CONTAINS DISSEM PYRITE ~4% IN XLS 1-3mm. WEATHERING PRODUCES COATINGS YLLW-GRN STAIN + POCKETS FLUFFY LIMONITE + EARTHY HEMATITE UP TO 10cm LONG. PROBABLY CONTAINS GOLD. →

(87)

CNTRY RK MED GR. GRAY QTZ MONZ
BIOT ~ 5%, QTZ ABT 20% REST
= AMTS GRAY VITREOUS PLAG & SLIGHTLY
PINK K SPAR. DIFFERS FROM REYNOT
IN LESS MAFIC & LACKS HBL
~ 3 CM WIDE ZONE KAOLINIZATION
ALONG WALLS OF VN. SOME VERY
CRSLY XLN (GR SIZE 5cm) CALCITE
NOTED ON DUMP. DONT KNOW RELATION
TO VN. SOME TALUS BLOCKS OF QM
HIGHLY FRACTURED SOME FRACTS
OFFSET BY OTHERS, FRACTURES FILLED
W BLACK GOETHITE (~10-15 FRACTURES
PER FOOT) RK SLIGHTLY ALTERED W
POSSIBLY SOME REXLZATION OF FELDSPARS
ALSO SOME QTZ STOCKWORKS.

AROUND ANNULAR ...SIONS 1-10 CM

SIGN AT CABIN "GREEN BEAR PLACER CLAIM"

LOC 2 ~ 400 M NE OF SHACK DOWN CYN
ADIT N10W INCL 30° ~30' LONG
10' IN SIDE ADIT INCL 20° N75E
~ 15' LONG. ADIT ON SHEAR ZN IN
QTZ MONZ. SHEAR $\frac{1}{3}$ - 1M THICK
~ N25W 30NE CENTER OF SHEAR
CRSLY XLN MILKY QTZ ~ 3-6" THICK
STRONG BROWN + YLLW BRW FEOX
COATINGS ALONG BASE OF QTZ ZONE.
ABOVE + BELOW QTZ 6-18" ZONE

(88)

HIGHLY SHEARED, KAOLINIZED &
SERICITIZED QTZ MONZ. FINE GR &
PUNKY.
ON DUMP FIND OCCASIONAL PIECES OF
QTZ WITH OXIDIZED CHALCOPYRITE
& THIN (1mm) STRINGERS MALACHITE.
(< 10%).
SHEAR ZONE PINCHES & SWELLS & CHANGES
ATTITUDE. OUTSIDE ADIT N55W 40 NE
ALSO LIMONITE PYRITE PSEUDOS UP TO 5mm COMMON
QTZ MONZ. SIMILAR LOC ~~1~~ BUT
SLIGHTLY MORE MAFIC. GET SOME
APLITE DIKES 1-3' THICK DIPPING
GENTLY NORTHWARD. RK SLIGHTLY
LESS KSPAR — GRANODIORITE

LOC 3 ~ 200 YDS DOWN CYN FROM 2
ON N WALL. ADIT INCL 35° N 80 W
ON SHEAR & QTZ VN N60W 30° ~1-2' THK.
SIMILAR TO LOC 3. QTZ MORE SMOKY &
GREASY CONTAINS ABUND. LIMONITE PYRITE
PSEUDOS. MALACHITE COMMON ASSOC W
OXIDIZED CHALCOPYRITE & FEOX POCKETS.
QTZ BRECCIATED & RESEALED W FEOX ALONG
CRACKS. SUGGESTS MAY BE GOLD PRESENT

(89)

10/30

LOC 1 HELICOPTER DROP OFF TREPIER RIDGE. OUTCROPS SERICITIZED GRANODIORITE ?) + KAOLINIZED SOME ALMOST COMPLETELY ALTERED.
ALSO LOOSE BLOCKS MASSIVE MILKY (SLIGHTLY SMOKY) QTZ, GREASY LUSTER, APPEARS BRECCIATED + RE HEALED
LIMONITE / HEM. COATINGS
- ON FRACTURES + DK GRN SOFT MINRL THAT MAY BE CERARGYRITE (?)
ALSO IRREGULAR BROWN FeOX PATCHES IN QTZ ≤ 1 cm LONG. 3 VNS NOTED
TR. ~ E-W 90°

TRAVERSE WESTWARD ACROSS BASIN OUTCROPS FINE GR BLACK TO GRAY SCHIST W HBL. PORPHYROBLASTS ≤ 1MM (~10%) SECOND DRAINAGE CONTACT QTZ MONZ GOING UP DRAW. LT GRAY QTZ MONZ. ~ 10% BIOT, 25% QTZ REST ≅ PLAG + K SPAR. ABUND ROUNDED MAFIC INCLUSIONS 3-10 cm LONG

POSSIBLY METAMORPHOSED REST SPRINGS SH.

LOC 2 TREPIER MINE ~ 500 YDS E OF LOC 1

ADIT IN QM S50E ON QTZ VN N60W 40 SW

ACTUALLY SEVERAL VNS

ADIT GOES IN ~ 30M W 4 STOPES

→

90

+3 WINZES BRANCHING OFF UP + DWN DIP
LONGEST STOPE ~ 10M + LONGEST
WINZE ~ 10 M.

VNS PINCH + SWELL MOSTLY ~ 40cm
THK BUT LOCALLY ~~FEATHERING~~ OUT
CRSLY XLN MILKY QTZ GRADING TO SMOKY
IN PATCHES SLIGHTLY VUGGY
CONTAINS 5-10% CHALCOPYRITE IN
SCATTERED POCKETS 1-3cm LONG. ALTERED
TO TENORITE ALONG CRACKS + COVELLITE.
STRONG GREEN MALACHITE COATINGS
ON QTZ + POCKETS + STRINGERS MALACHITE
IN OXIDIZED MATERIAL ALONG WALLS.
QM KAOLINIZED IN ZONE ~ 1M WIDE ABOVE
+ BELOW VN.
FOUND ONE PIECE BLACK METALLIC
XLN MNRL WILL TRY TO IDENTIFY

~~NE~~ ~20 M EAST UP HILL 2ND ADIT
SIDE ON SAME VN ~15M LONG
W OPEN STOPE TO SURFACE.

ARTIFACTS INCLUDE SEVERAL OLD
CANS PRE 1900 CANS, AN ANVIL, HAND DRILLS, AN
OLD BOOT + A CARTON SAYING
"CARNATION WHEAT FLAKES"

→ SAMPLE S 0190

(97)

LOC 3

PARTLY CAVED ADIT IN QTZ MONZ. INCL 30° S50E
SEVERAL QTZ VNS CUT QM IN 10' WIDE
ZN. VNS N60W 35SW 3-10cm THK.
QTZ LIKE LOC 2 MASSIVE GREASY
MILKY QTZ, BRECCIATED & REHEALED
POCKETS OF CHALCOPYRITE PARTLY ALTERED TO
TENORITE + COVELLITE UP TO 1Cm
UP TO 5% & COATINGS MALACHITE
ON QTZ & IMPREGNATING ALTERED
QM. QM MODERATELY SERICITIZED
& KAOLINIZED + WEAKLY SHEARED
// VNS. VERY SIMILAR TO LOC 2
BUT NOT AS RICH IN Cu.
HEAVY LIMONITE & BLACK GOETHITE COATINGS
ALONG WALLS OF VNS & POCKETS
CELLULAR LIMONITE

NOTEBOOK II

RECORDER: D. McFARLAND

Book 2

(1)

2-1	9/5 shear zone bx N 70-70E 60° ... large area of highly silicified "jasperoidal" Rest springs? - hornsfels vuggy qtz. 1 hm section of Tin ... 100'± thick N 13 W 40SW underlain by ... Los ... shear zone appears to continue over ridge to east
	10/6 Burgess Mine - description of dump - qtz vein containing abundant limonite w/ some ... material brecciated, some vein material also ls & altered silicified on dump granitic - possibly dike material - several ... qtz slickensided / trending N 10-20 W.
6-659-3	Incline shaft - open - driven on fault N 0-20 65W, located on south side of ridge shaft in foot wall (silicified material - ...)
6-659-4	second shaft on south side, also in footwall of fault along contact w/ intrusive (highly silicified) fault N5W 53W 710 wide gouge zone

(2)

10/4/62 — in ls the shaft 100' SSE of the above

Adit - caved - probably 200 ±' below the collar of the upper shafts.

General observation: all workings thus far examined - including trenching - are along the contact of a highly slickensided intrusive (aplite?) dike(?) and ls.

6-659-8 Shallow incline shaft at 30° simular situation - located 200± ft west of adit at same elevation. driven in foot wall of 10' wide shear zone N 10 W 65 W.
Note! Vein material present on dump - no indication of vein-like material in back face or walls of shaft

Just north of dump next to road ls bx - possibly interformational - fragments rounded

③

10/6

02-06 Prospect pit - Aplite(?) dike - alteration - sericite; pyrite 1-2%, ; vuggy qtz vein material w/ much limonite [illegible] cubic box work probably pyrite or galena [illegible] eastern [illegible] pit bounds dike - contact w/ argillaceous [illegible] ls [illegible] N45E [illegible] dike. Vert shaft 30' south of prospect pit, sunk on dike appears 50-60° dip - 2 [illegible] to bottom dike material same as pit except for sample 0206 which has siderite gaunge - (siderite common gaunge mineral of piece [illegible] metal deposits eg. Coeur d'Alene district Idaho) dike may have good potential for lowgrade Au.

02-07 On road below Burro. ls, thin, bedded N25W [illegible], 50° NE below adit ls is silicified (hornfelsed) near faulty dike. hornfels continues around bend where larger "dike" sill is encountered sill is same as described elsewhere

02-08 ls, thin to thickly bedded, dk gry, unaltered N10W 40W. Fault N45E 68S w/ dike intruded along its dike 15' wide

(4)

10/7

02-08 dike rock very altered - Kaolinized, sericitic (argillic alteration) possibly biotite diorite - NO vis. qtz
see sample,
caved adit in ls & fresh hypabyssal dike or sill no mineralization -
located ≈ 150' SE of 02-08 ~~a~~ above rd. below adit ls fol'd by 50' thick altered, lt colored (sericitic) "dike" or sill containing biotite & feldspar - SE of dike is hornfels ls. area along rd contains broken rx & gouge - probable fault

02-09 Intrusive, qtz poor (color gray, ..., biotite
see sample grades into wht ... rx resembling aplite (see sample)
area along road is brecciated

02-10 ls, hornfelsed, N30W56W
location - 1st switch back

Photo 7-640 (5)

10/25/[illegible]

02-11 lamprophyre dike (possibly pyroxenite or amphibolite) 30' wide fresh w/ [illegible]
N10E -

02-12 [illegible] Qtz Monzonite, [illegible] w/ aplite dikes. N[illegible] (prospect pit)

02-13 Qtz vein in QM; N SE 30W, vein material [illegible], vuggy contains indigenous limonite & calcite some malachite

02-14 Qtz vein in Qm - prospect pit vuggy, contains much "limonite" mostly hematite - red some goethite - yellow-orange, also contains chalcopyrite & malachite (sample) argillic alteration - locally sericite & kaolinite. In vicinity, QM "bleached" along fractures - numerous prospect pits for 100 yds + East along ridge top

02-15 Silicified Ls - vuggy - resembles white marble - no reaction w/ acid

02-16 Qtz vein in Qm, prospect pit, vein vuggy, contains limonite, [illegible], calcite argillic alteration adjacent to vein. limonite. both transported & indigenous
* Qm contains pink veinlets (pink [illegible]) K spar. Argillic alteration [illegible]

(6)

Photo 7-640

02-17 Qtz vein in Qm continues
[illegible] here & [illegible] point.
calcite, chalcopyrite, chrysocolla, [illegible],
chalcocite – [illegible] – see sample
Qm – fine grained

02-18 Qtz vein in Qm (fine grained)
argillic alteration in wall rock.
Vein 2+ feet [illegible] mined by
room & pillar method. Vein
"bull qtz" w/ 20–30% [illegible]
containing malachite (see sample)
chalcopyrite on dumps [illegible]
N85E 35N

02-19 Big Horn Mine. Adits caved or
unsafe. Inclined shafts sunk
along shear-zone N75E 80N (?)
Mineralization: chalcopyrite, azurite,
malachite, limonite (zone 6" thick [illegible]
contains qtz veins of lesser [illegible] min.
thickness.

(7)

Photo 7-641 10/28/76

02-20 Ls., grey-white, thinly bedded located on west limb of anticlinal fold N45W 60W

02-21 QM, porphyritic - sill 15' wide

02-21a Mafic dike N70W 58W, 5' wide located 200' from sill. Dike is porphyritic with dark mafic, probably biotite. comp probably [illegible] - [illegible] for reddish brown.

02-22 Qm. sill very near contact, Qm is altered - moderate argillic alteration, ie. kaolinite & sericite appeared to unaided eye, width of sill undetermined due to overburden

Note: Much altered float 1st 1/4 mile along rd in bottom of canyon - Argillic

02-23 Ls, dk gry, N5E 60W. Unconformably overlain by flat lying ls. (contains fossil [illegible])

(8)

7-64

02-24 granitic dike N3E 55E, 10' thick, cuts ls ~~is~~ viewed from distance on N side of canyon. weathers red-yellow-b

ls is thick bedded (2-3') alternating ltgry, dkgry beds N40E 15SE

02-25 Granitic Sill [illegible]
bleached so that it resembles aplite, all Fe-Mg minerals destroyed. Much brn staining (heamatitic & limonite) pseudomorphs of limonite after pyrite. Where exposed 15' thick possibly more. terminates in hornfelsed ls to E

0226 Oc simular to the above on opposite (N) side of canyon surrounded by talus

0227 Qm stock(?), highly to moderately altered - argillic alteration. All Fe-Mg minerals destroyed, feldspar altered to sercite & Kaolinite. RK highly fractured - spacing approx 1 fracture every 1/2 inch.

(9)

7-691

The OC is heavily iron stained w/ thick coatings of limonite and hematite. It is S[illegible] of color anomally on opposite ridge.

02-28 Granitic rx - lt colored - resembles aplite or alaskite - equigranular few FeMg minerals [illegible]

02-27 Vein N33E 20N [illegible]
[illegible], [illegible]
massive [illegible]

Photo
6-663
10/29

6' wide qtz vein in QM pyrite, calcite qtz (smoky) vein vuggy w/ vug at face 1-2' wide 10' long lined w/ qtz xls, pyrite content of vein 3-5% pyrite has a silver luster. QM slight Argillic alteration, Stock work of qtz nearby also much goethite

~~02-30~~
Chucks photo
#1

Photo
6-663

(10) 10/28/76

2 shear zone in QM N55W 40N
6' thick. Qtz vein - contains
$CuFeS_2$, ~~CuO (copper oxides)~~
chrysocola, limonite after
pyrite, & chalcopyrite
country rx - biotite qtz diorite
w/ coarse stockwork of
aplite veins spaced at
3' intervals. w/out offset.

3 - Dump ~~on ...~~ qtz w/ chalopyrite,
malachite, chrysocola/or azurite,
siderite - also much limonite
& goethite - yellows thru maroons

Photo 7-641 10/30/76

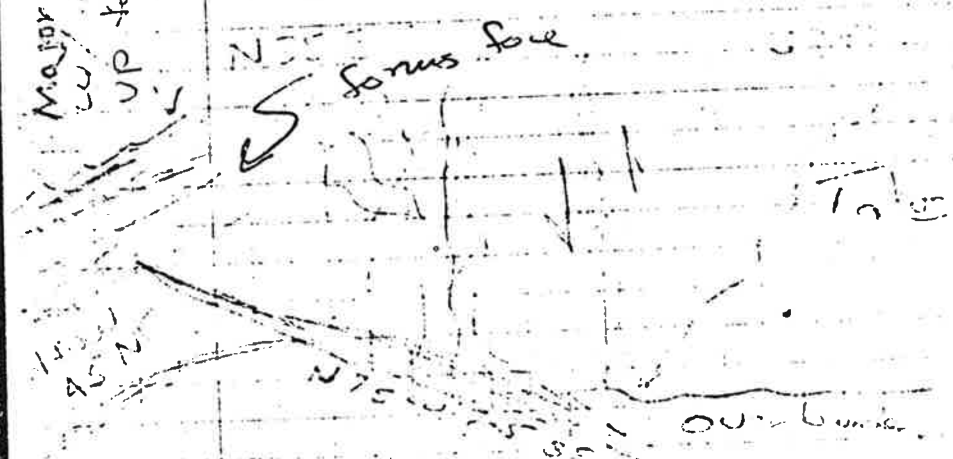
02-29 claim on Pyrrotite [illegible] vein
claim line runs EW.
General observations: country
rock to west is equigranular
biotite qtz monzonite or
granite. sample 02-27a
which has been intruded
by 0229 b (qtz diorite
or granodiorite dike(?))
further west rx became fine grain
equigranular. - still QM

(11)

Just west of point Q2 29 d ... are bleached w/ ~~...~~ some limonite & iron staining directly above this point is a wide ... flat lying w/ ...

Fault directly above present N65W 80 S. ... planes indicate vertical movement

Major shear zone ... up to 3' wide



strike changes to N 60 W 50 S above N 40 W 70 ...

Landstar # 1
May 20, 1968
Son - Ind. Metals

(12)

Claim runs 750' [illegible] of
vein and 300' N & S [illegible]
of vein discovery

Photo 7-641
02-30

Tactite(?), dense, hard rock
equigranular structure (*In* contact
w/ both ls & QM. This rock
type is responsible for the
color anomaly on photo.)
Rock composed of garnet &
tremolite(?) or ~~other metam~~
similar metamorphic mineral.
__Note__: We are co/in the
Bishop Tungsten district -
at Union Carbide ore occurs
at contact of tactite w/ QM.
__See__ __Sample__ 02-30. Tactite
cut by QM dikes having
moderate to severe argillic alteration
sample 02-30a taken
from gossan adjacent to
dike. West of 02-30
QM is mod. to severly altered,
(argillic), highly fractured,
and covered w/ haemotite &
goethite

(13)

11/17/76

See Ubhebe Peak Quad #1

Cerrusite Mine Area. General: Three adits refered to by McAllister as A, B & C from lowest to highest elevation. Total development of 3 adits & winze probably doesn't exceed 600'. Production was mostly from A. Occurrence: Qtz vein in sheared altered granite (quartz monzonite with local aplitic texture), gouge zone intensely sericitized in hanging wall.

Vein N65W 63N. Shear zone atleast 10' wide — foot wall covered by talus.

Minerals — cerrusite, fine grain galena, chalcopyrite & chrysocolla, quartz & limonite. Galena reported to carry silver.

If projected the vein on A level would not tie in w/ working above. see discussion in McAllister

Workings accessable but were not entered

(14)

A short adit has been driven from rock on N 60 W strike since McAllister examined the property

Tram Line from ... from E ... 10 ... Al ... located just south of Cerrusite mine

See geologic map of ... area ... Div. Mines Geology ... Vol. ... Rpt 42 — McAllister. ... ... contact w/ ...

11/17/76

#2

Adit driven in altered QM near & under contact w/ limestone - ... Shear zone w/ ... N 35 E. 90 ... 10' wide mineralization in zone poorly defined. Outcrops stained red - brown by limonite - distinct color anomaly

15

11/18/76

No 3 sample from prospect pit in hornfelsed ls - tactite. ls partly altered to tactite
N17W 45W

No 4 Tactite - hornfels N13W 53W
No 5 Just N. of No 4 in (15') 20 - 25' shaft (vert)
Vein not exposed on surface. Qtz jasper, malachite & limonite on dump.
see sample. Just N. of No 5 - ... road QM ... is encountered and continues to ... in cut until point No 6

No 6 Basalt flow - ... w/ ...

No 7 Biotite Quartz Monzonite - equigranular

No 8 Hornfels Tactite A contact metamorphic deposit - Copper, Minerals chalcopyrite 10 to 15% (Sample 8A) by volume over a 15 to 20 foot width
Malachite & Azurite up to 5% ...
ore body strikes N11°E 75°W - parallel or subparallel to strike of Tactite
chalcopyrite occurs in association w/ a zone of Tremolite(?). The footwall consist of a white (marble) or dolomite which has crystalized w/ xls 2+ mm in size (sample 8B). The hanging wall appears to be a "cooking" ls grading to tactite.

(16)

No 8 The deposit is limited along strike due to its location on the nose of a small ridge, however the steep dip, i.e. 75°, and given the fact that it is on a dip slope give it a good depth potential. w/ low mining cost. Further it may lengthen along strike with depth.

Gangue minerals: Calcite, Siderite, quartz. Siderite occurs w/ chalcopyrite (?)

NOTEBOOK III

RECORDER: C. SABINE

SALINE PLANNING UNIT

INDEX BOOK 3

①

11/15/76
LV RIV 1030 ARR LONE PINE 1530
NIGHT IN DOW VILLA

11/16 MEET MCFARLAND LONE PINE 0800
LV LONE PINE 0900 ARR. SAN LUCAS
CYN TRLR. 1000 HRS

PM TRAVERSE ~½ MILE DOWN LOWER
SANLUCAS CYN FROM MOUTH OF
BONHAM CYN. STRATA CHIEFLY
GRAY TO DK GRAY LS W INTERBEDS OF
TAN SHALE. PROBABLY KEELER CYN
FM. CONTAINS FUSULINIDS & FOSSIL
HASH IN SOME LAYERS. LOCALLY
RECRYSTALLIZED CRSLY XLN CALCITE WITH
SMALL XLS WOLLASTONITE (?).
BEDS DIPPING MODERATELY N TO NE
APPARENTLY RIGHT SIDE UP ON BASIS
QUESTIONABLE X-BEDDING, SCOUR & FILL &
GRADED BEDDING (?). NUMEROUS SMALL
FOLDS PLUNGING MODERATELY NORTH.
BEDS LOCALLY DISRUPTED BY PLASTIC
FLOW. NUMEROUS FAULTS TRENDING
~N40E & N30W CUT BEDS. MUOESET
NW SIDES DOWN UP TO 100'. RKS
BRECCIATED ALONG FAULTS W. FRACTURES
FILLED W SECONDARY WHITE CRSLY-
XLN CALCITE →

②

IN UPPER PART OF NELSON RANGE
E OF CYN BEDS IN LARGE
RECUMBENT FOLD CONVEX NE
LOWER PART BEDS DIPPING N TO NE
HORIZONTAL DISCONTINUITY SEPARATING
UPPER + LOWER - POSSIBLE THRUST ??

11/17
LOC 4 PHOTO 10-516
~1/4 MI SW OF WHITE MTN TALC MINE
W BONHAM CYN
3 ADITS IN HIDDEN VALLEY DOLOMITE.

a. SE ADIT ~200' DUE WEST
DUMP HAS CRSLY XLN MILKY QTZ; GREASY
LUSTER; SLIGHTLY VUGGY. QTZ CARRIES
SCATTERED XLS GALENA (≤5mm, ~2%)
+ ABUNDANT STRINGERS + COATINGS OF
CHRYSOCOLLA UP TO 5%. ALSO A PILE
OF CELLULAR DK BROWN TO BLACK
GOETHITE GOSSAN IN BLOCKS UP TO
50 CM LONG. GOSSAN SHOWS THIN
QTZ SEAMS FORMING 1CM BOXWORKS +
XLS CERRUSSITE SCATTERED THROUGHOUT.

GALENA
DK GRAY
ALSO SCATTERED
PSEUDOS ...ITE
... 1%

③

b ~100' W OF a. WOODEN CABIN
MAGAZINES FROM 1941 (COLLIERS).
BEHIND CABIN 2 ADITS + OPEN STOPE
ALL INTERCONNECTED. WORKINGS
FOLLOW OXIDIZED VN ~ 50cm THK
N25E 40SE FOR DIST. ~ 100'
WINZE DOWN DIP OF VN AT LEAST 100'
OXIDIZED VN LT BROWN FINE GR
ARGILLIC W SOME GREEN CU STAIN
DUMP SHOWS CRSLY XLN MILKY
QTZ W SCATTERED GALENA XLS
(≤5mm, ~1%) SPHALERITE (≤1cm,
<1%) + PYRITE IN SCATTERED XLS +
PSEUDOS. + IN POCKETS UP TO 3cm LONG
COMPOSED OF ~50% SMALL (<1mm) XLS;
+ CHRYSOCOLLA STRINGERS + COATINGS.
DUMP ALSO HAS CHUNKS CELLULAR
BLACK TO DK BRWN GOETHITE
CONTAINS CERRUSSITE AS AT a.

c. ~150' N25E FROM b
2 DRIFTS FROM COMMON PORTAL. ONE
~50' DUE WEST, OTHER ~15' DUE N.
BRECCIATED H.V. DOLOMITE W
TAN OXIDIZED VNS ON ~ SAME
TREND AS AT b.
SIMILAR MATERIAL ON DUMP AS AT
a + b. GOSSAN CONTAINS RICH
POCKETS PYRITE (~50% W XLS

④

UP TO $\frac{1}{2}$ cm)

SAMPLES, 0304. TAKEN FROM 3 SITES (a, b, c)

SPECULAR HEMATITE ALSO IN GOSSAN; ALSO

POSSIBLE ANGLESITE (?) + SMITHSONITE (?)

POST NEXT TO RD ~ 200 YDS S OF LOC 4

METAL TAG DOUG 1 SW CORNER

DOUG 2 SE CORNER

LOC 5 PHOTO 10-5/6

~ $\frac{1}{2}$ MI ~~TOC~~ SW OF WHITE MTN TALC MINE

AT END OF RD. WOODEN SHACK

NO ARTIFACTS.

LOWER ADIT NEXT TO SHACK.

SIDE ALONG STRIKE OF 15 cm THK

QTZ VN W. DIPS 60°E. 35' INSIDE

OPEN STOPE TO SURFACE (~30')

+ CAVED WINZE. ADIT CONTINUES

UNKNOWN DIST BEYOND (>30')

(ARS)

AT PORTAL ALTERED GRAY MED

GR. QTZ MONZ. EXPOSED. INTRUDES

HV. DOL BUT CAN'T TELL RELATIONS

EVIDENTLY ELLIPTICAL BODY ELONGATED ~100 MTRS

SW.

DUMP HAS CRSLY XLN MASSIVE MILKY

QTZ W POCKETS + BANDS CHRYSOCOLLA →

6)

COMMON, AZURITE LESS COMMON. QTZ CONTAINS SCATTERED XLS GALENA (1-5MM, ~1%) ASSOCIATED W SPHALERITE (1-2CM, <1%). ALSO LARGER POCKETS GRAY
? METALLIC MNRL NO CLEAVAGE. POCKETS UP TO 3CM LONG (≤ 10%)

SAMPLE 0305 ↑

~ 200 MTRS N OF LOC 5 POST
"DOUG 2 SW CORNER

11/18
TAKE RD EAST FROM LOC 4 PHOTO 10-516 DOWN DRAW, OVER RIDGE & S INTO NEXT CYN. IMPASSABLE BY VEHICLE

LOC 6. 10-5/6 : BOTTOM OF CYN ORE LOADING CHUTE FROM MINE UP HILL TO SE.

"1974" PAINTED IN RED ON BIN AS AT LOC 1 10-516. ALSO PAINTED IN BROWN "HELEN CLAIM - 1973 WARK (SIC) DONE PbO. B115"
TALC IN BW

→

(6)

~150' NE ON TRAIL UP TO MINE. POST W METAL TAG "1970 - MAN O WAR DL - S.E. CORNER POST."

LOC. 7 ~100 MTRS SE UP HILL FROM LOC 6
ADIT S20°E ~ 6 MTRS LONG IN TALC BODY IN H. V. DOLOMITE
TALC ~ 3 MTRS THICK N20W 40 SW W 1 MTR SQUARE BLOCK WITHIN IT OF UNALTERED DOLOMITE. TALC IS MOTTLED DK GRAY & GRAY GRN TWO COLORS INTERGROWN. CUT BY SEAMS 1-3cm THICK WHITE TALC W IS POWDERY. ALL TALC SEEN VERY SOFT + SOAPY - VERY PURE.

OUTSIDE POST DISCOVERY MONUMENT METAL TAG "HELEN 1970 - MONUMENT LOCATION - DL
NOTICE OF LOCATION;
HELEN TALC 1975
1100' NW & 400' SE FROM DM
DELBERT LEONARD
BOX 6
LONE PINE

BOOK 604
PAGE 115

SLOPE WASH DETRITUS CONTAINS

⑦

BLOCKS GRAY MONZONITE PORPHYRY FAIRLY COMMON.
~ 200MTRS ACROSS CYN N60W FROM MINE A BROWN DIKE EST 1M THK DIPPING ~70° NE CUTS HV DOL. PROJECTION OF DIKE PASSES 100-200' NE. OF MINE

DROVE FROM WHITE MTN MINE TALC MINE WEST INTO UPPER BUNHAM CYN & HIKED UP N FORK OF WASH ALONG NE SIDE OF BASIN. WASH MARKS CONTACT OF QTZ. MONZ TONE & LS SW
QM LT GRAY MED GR (1-2mm) EQUIGRANULAR QTZ ~20%, BIOTITE ~5% REST ≅ KSPAR & PLAG. LS. LT GRAY & DK GRAY LAMINATED (PROBABLY LOST BURRO BUT DARKER THAN IN CERRO GORDO — MAY BE TIN. MTN ?) CONTACT CONTINUES BEYOND SADDLE AT N RIM & DOWN UNNAMED CYN DRAWING NE INTO SALINE VALLEY. DID NOT SEE ANY EVIDENCE MINERALIZATION ANYWHERE.
N. OF SADDLE IN ~~MAE~~ FACE OF INYOS SPECTACULAR ISOCLINAL FOLDING OF LOST BURRO & TIN MTN LS ON VERY LARGE SCALE DOWN TO SMALL SCALE (AMPLITUDES UP TO ~1000') MOST FOLDS HAVE NEAR VERTICAL →

(8)

AXIAL PLANES W TRENDING APPROX N
PLUNGE UNKNOWN BUT PROBABLY
GENTLY NORTH. ALSO SOME
RECUMBENT FOLDS W AXES APPROX NORTH.
EITHER DISHARMONIC OR MULTIPLE
FOLDING

~200' EAST OF SADDLE OLD ROCK
SHELTER MADE OF BLOCKS OF QM
~ 3 MTRS SQ WALLS ~ 1-1½ MTRS
HIGH W ROOF OF JUNIPER LOGS.
BROKEN GREEN BOTTLE ~ 3½" X 5 X 19 cm
EMBOSSED W "BARSAPARILLIAN RESOLVENT"

RETURN TO WHITE MTN MINE

LOC 3 PHOTO 10-515
AT NE EDGE OF TALC OPERATION
FRACTURE ZONE IN HV DOLOMITE
N70W 90° W VNLTS + BLEBS
MILKY QTZ. MINERALIZED WITH
MALACHITE + LESSER AZURITE + GALENA
QTZ CRSLY XLN, VUGGY ~ GOOD
EUHEDRAL XLS. MALACHITE + AZURITE
COATING QTZ + IN SMALL POCKETS
ALSO GRAINS OF CHALCOPYRITE
UP TO 1cm (<1%) ALTERED TO CHRYSOCOLLA
GALENA IN SCATTERED XLS ≤ 1cm ~1%.
SMALL PROSPECT ON SITE →

MARKER AT PROSPECT
"S. CENTER END CERRO GORDO
SOAPSTONE NO 5"
ACCORDING TO WRIGHT & PAGE (SRE)
THIS SITE ALSO MINERALIZED W ZINC.

11/19 WITH McFARLAND TO
CV PROSPECT IN NELSON RANGE

LV. SAN LUCAS 1430; ARR LONE
PINE 3:30. LV. LONE PINE 1545
VIA CHARTER PLANE, ARR. RIVERSIDE
1700

11/22-24 OFFICE

11/29 LV RIV. 0730 VIA CHARTER PLANE
ARR LONE PINE 0915. LV LONE PINE
1200 VIA BLM VEHICLE; ARR. SAN
LUCAS CYN 1300. PM IN TRAILER
MAKING REPAIRS

(10)

11/30
LOC 8 PHOTO 10-516
W. SIDE DRAW W GOES S OFF
BONHAM CYN. POOR RD UP
DRAW ~200 YDS TO BEAT-UP SHACK
& TRAILER. POST NEAR SHACK
"NW CORNER COMMET (SIC)
SW CORNER MARS"
AT LOC 8 ADIT IN LT TAN
SACCAROIDAL HIDDEN VALLEY
DOLOMITE N80E ~ 5 MTRS
ROOF STOPED OUT ~~5~~' FORMING
ROOM ~ 5' HIGH. ADIT ON
VN OF TALC ~ 1 MTR WIDE
N80E. 60 SE. TALC
PURE WHITE W FEW SMALL
POCKETS Red FEOX STN
TALC FINE GR SOFT SOAPY
APPEARS VERY HIGH GRADE

OUTSIDE ADIT. POST W METAL TAG
"MARS NO. 1 LOCATION
MONUMENT POST 1970"

LODE LOCATION NOTICE
MARS #1 1000' WESTERLY & 500' EASTERLY
FROM LOCATION MON.
DELBERT LEONARD 1975
BOOK 62 p 160

(11)

LOC 9 PHOTO 10-516
OPEN CUT N SIDE BONHAM CYN
~ ½ MI E OF WHITE MTN TALC
CUT ~ 40 MTRS LONG ONLINE N70E
WALLS ~ 8 MTRS HIGH
WHITE, PALE GREEN & GRAY TALC
INTERLAYERED WITH GRAY FINE
GR. MASSIVE QTZITE ~ 50/50
LAYERS 10-50cm THK N60W20SW
HIGHEST GRADE. WHITE TALC MED
GR W XLS 1-3 mm LONG IN
SCHISTOSE TEXTURE FORMING LAYERS
OF PURE TALC. PALE GREEN
TALC VERY PURE FORMS LENSES
~ 1-5cm THK IN GRAY TALC
W IS SLIGHTLY SILICEOUS.
GRAY TALC LOCALLY FORMS
FRAGMENTAL STRUCTURE AS AT
HOLIDAY MINE FRAGS 1-5 cm
DK GRAY TALC EMBEDDED W
LT GRAY TALC

LINE OF PROSPECTS EXTENDS ~200 MTRS
EASTWARD FROM PIT DESCRIBED
FROM WEST TO EAST

a. ADIT N35E ~ 10 M WHITE TALC & WHITE
QTZITE

→

(12)

b. ~100 M E OF a.
OPEN CUT ~ 12 M LONG ON LINE
N50W ~5M WIDE & 3 MTRS DEEP
WHITE TALC LAYERS IN BUFF
COLORED HV DOL. LYRS N50W 20NE

c. ~25 M E OF b. SMALL CUT IN HV DOL
WHITE QTZITE LYR ~ 20CM THK.
NO TALC

d ~20M ESE OF c. CUT ~ 10M LONG N50E
4M WIDE & 2M DEEP. WHITE QTZITE
& WHITE TALC IN HV DOL.

e ~ 35M ENE OF d. ADIT N20W ~ 10M
WHITE & SOME GRAY TALC & WHITE
QTZITE IN H.V. DOL.
5M E SMALL PIT SHOWING SAME

f. ~50M E OF e SEVERAL CUTS
IN HILLSIDE 10-20 M ~~ACROSS~~ LONG
EXPOSE WHITE TALC & QTZITE
IN H V DOL.

LINE OF 5 SIMILAR PROSPECTS EXTENDS EASTWARD
FROM F TO BOTTOM CYN NEAR WOOD SHACK
HIDDEN VALLEY DOLOMITE HIGHLY
SILICIFIED AT EAST END OF
PIT & AT PROSPECTS a&b. BECOMES
LESS SILICIFIED EASTWARD

(13)

12/1
LOC 10 PHOTO 10-516
BOTTOM BUNHAM CYN OFF LOC 9
ON S. SIDE. CUT IN HILLSIDE
~15M LONG ON LINE N70W
TALC IN WESTERN $\frac{1}{3}$ OF CUT
BANDED GRAY & WHITE TALC W
LAYERS 15-50 CM THICK.
WHITE TALC VERY PURE SOFT SOAPY.
GRAY TALC HARDER MORE
SILICEOUS. LAYERING N65E 90
MUCH OF TALC PULVERIZED TO
FINE POWDER ALONG SHEARS
// LAYERING. BUFF COLORED
HV DOL. FORMS S WALL
OF PIT. NO TALC MINERALIZATION
ON HILLSIDE SOUTH OF PIT.

TWO SMALL PITS ON N SIDE OF
CYN NEAR BOTTOM SHOW WHITE TALC

LOC 11 10-516
BOTTOM BUNHAM CYN SOUTH SIDE
~200 MTRS E OF LOC 10
BAND OF PULVERIZED WHITE TALC
~30 MTRS LONG X 10 M WIDE
TRENDS N65E BOUNDED N+S
BY BRECCIATED HV DOL. →

(14)

BRECCIA CLASTS 1-5 CM LONG
HIGHLY SILICIFIED

LOC 12 10-516
ON SMALL SPUR S SIDE BONHAM
CYN ~100 MTRS E OF 11
PIT ~7 MTRS LONG E-W X 4 MTRS WIDE
+ 3 MTRS DEEP. WHITE FINE GR
TALC VERY PURE

LOC 13 10-516
JUST NE. OF 12
LARGE OPEN CUT ~ 70x70 MTRS
~ 25 MTRS FROM TOP TO BOTTOM
VERTICALLY. 3 LEVELS. REMAINS
OF AT LEAST 5 ADITS MOSTLY CAVED
OR BURIED BY DEBRIS PROBABLY
PREDATED OPEN CUT OPERATION
MOSTLY WHITE + PALE GREEN TALC
INTERLAYERED W GRAY SILICEOUS TALC
WHITE + GRN MOSTLY VERY PURE BUT
SOME MIXED W. GRAY TALC. SOME
GRAY FINE GR. MASSIVE QTZITE BUT
NOT COMMON. LAYERING ~N65E
DIPPING 90° ON N SIDE; 70-80° SW ON
S SIDE. SOME ANGULAR BLOCKS
UNALTERED H.V. DOL $\frac{1}{2}$-3 MTRS
LONG EMBEDDED IN TALC // TO
LAYERING. NOT COMMON

(15)

RX STAINED LT BROWN ALONG ZN.

OPPOSITE SIDE BONHAM CYN FROM LOC 13 HV DOLOMITE BRECCIATED IN ZONE TR. N65W APPEARS TO DIP STEEPLY NE. TALC MNRLZATION OF LOCS 9-13 LIE BTWN TWO BRECCIA ZNS. NO TALC NE OR SW OF THIS BLOCK. OUTCROPS HV DOL WITHIN BLOCK HIGHLY FRACTURED - SILICIFIED ADJACENT TO TALC BODIES.

LOC 14 10-5-16

S SIDE BONHAM CYN ~300M E OF 13 AT BOTTOM. CUT IN HILLSIDE ~50M LONG EXPOSES WHITE + GRAY TALC IN 5 MTR WIDE BAND AGAINST FRACTURED HV DOL. OVERLAIN BY ~100' OF FANGLOMERATE. ANOTHER CUT ~10M LONG ON N SIDE W WHITE + GRAY TALC

OLD ROAD TAKES OFF SE ALONG S SIDE CYN TO LOC 15

LOC 15 10-5-16

2 ADITS + 1 SMALL CUT EXPOSE SMALL AMT WHITE + GRAY TALC IN THIN STRINGERS
ADITS DUE S. CAVED
UPHILL TO SW STEEP LEDGES →

(16)

WHITE FINE GR MASSIVE QTZITE
IN ZONE ~ 50M WIDE ALONG
NE SIDE OF FAULT
TRENDING N30W HV DOL
ON SW SIDE. SOME HEAVY
DK BROWN FEOX COATINGS W
HV DOL LOCALLY ALONG FLT
BUT NO MINERALIZATION SEEN

12/13 LV. RV 1100 HRS
ARR SAN LUCAS CYN 1900 HRS
LUNCH & DINNER ON RD

MI. 12/14
22501.9 JCT BINHAM CYN & SAN LUCAS CYN
WEST UP B.C. RD
OUTCROPS KEELER CYN FM MAPPED
AS BIRD SPRING BY McALLISTER

02.5 TAKE RD N OF B.C. RD SAN LUCAS FAN

03.8 RD TURNS UP WASH SW PHOTO SHOWS
FORK DOWN WASH NE

3.9 PHOTO 10-515 LOC 4
OUTCROPS KEELER CYN FM. AS MAPPED BY
MERRIAM. MOSTLY WHITE SILICEOUS LS
SOMEWHAT RECRYSTALLIZED INTERBEDDED W
DK GRAY SILICEOUS LS IN LAYERS 10-40cm
THK. BEDDING LOCALLY DISRUPTED BY
PLASTIC FLOW FORMING BOUDIN-LIKE
STRUCTURES. ATT N10W 70°NE

4.4 LOC 5. 10-515
BRECCIA ZN ~100' WIDE ~~N~~40 W
SEPARATES REST SPRING SH ON SW
FROM KEELER CYN FM ON NE
TRAVERSE WEST UP HILL AT LEAST

(18)

3 BRECCIA ZNS IN R.S. Sh.
W THICK COATINGS CELLULAR DK
BROWN GOETHITE. NEAR TOP OF
RIDGE ~~DK GRAY~~ CONTACT W DK
GRAY CHERTY THIN-LAMINATED
TIN MTN LS. TOP OF RIDGE
FRIABLE SS OF PERDIDO FM.
IN DRAW WEST OF RIDGE
CONTACT LOST BURRO FM.
MANY OF CHERT NODULES IN TIN
MTN SURROUNDED BY REACTION RIMS
1-2cm WIDE OF WHAT APPEARS TO
BE WOLLASTONITE (?) REPLACING
LS.
SAMPLES OF NODULES 0317

05.0 RD WASHED OUT. SPECTACULAR BADLANDS
TYPE EROSION OF SAN LUCAS FAN
GRAVELS. ~1/2 - 3/4 MI UP RD
UNIDENTIFIED UNDEVELOPED CLAIMS
ALONG FAULT N35E SEPARATING
LOC 6 → LOSTBURRO ON NW, FROM TIN MTN
& REST SPRING ON SE. BRIGHT RED
FeOx COATINGS ON TM FRAGS IN
BRECCIA ALONG FAULT. ABUNDANT
NO MNRLZTN CRINOIDS IN TM - SAMPLES COLLECTED.
FLAT AREA AT END OF RD MAY HAVE
BEEN DRILL SITE BUT NO DRILLHOLE
LOCATED. LOSTBURRO SLIGHTLY ALTERED &
SILICIFIED. NO TALC

(19)

12/15
RETURN TO LOC 4 10-515 (P.0317'
HIKE UP SIDE CYN WNW

LOC 7 10-515
FAULT ZONE N10E ~50°W (?)
SEPARATES LOST BURRO ON WEST
FROM KEELER CYN FM ON EAST
BRECCIA ZN ~ 50' WIDE W ANGULAR
CLASTS. KC UP TO 10cm LONG
CEMENTED BY CRSLY XLN CALCITE
W CLEAVAGE RHOMBS ~1cm. BRECCIA
STAINED RED BY HEMATITE.
EXTENSION OF FAULT ZN AT LOC
5 (10-515) BUT REST SPRING,
TIN MTN + PERDIDO MISSING

LOC 8 OUTCROPS NE SIDE CYN
ALTERED GRANODIORITE MED GR
EQUIGRANULAR. CHLORITIZED MAFICS (HBL?)
~ 15%, QTZ ~15% REST FELDSPAR
~2:1 PLAG OVER KSPAR. ABUNDANT
INCLUSIONS FINE GR SILICEOUS WHITE
CALC SILICATE SCARN FORMING
MIXED BAG. ~ = GRANODIORITE + SCARN
APPEARS TO BE ~~LARGE~~ APENDANT
OF SILICIFIED LOST BURRO SURROUNDED
BY GRANODIORITE

~ 400 MTRS SOUTH OF LOC 8
ON SE SIDE OF CYN OUTCROPS
GRAY MED GR EQUIGRANULAR HBL
GRANODIORITE HBL ~20%, QTZ ~10%
REST FELDSPAR ~2:1 PLAG
WELL FOLIATED N50E 80SE W
ABUNDANT FINE GR MAFIC INCL
FLATTENED // FOLIATION UP TO 10CM
LONG

TRAVERSING WEST RK BECOMES LESS
MAFIC BIOT & HBL < 10% QTZ ~15%
~ = KSPAR & PLAG
MED GR EQUIGRAN QTZ MONZ
WELL FOLIATED W FLATTENED
MAFIC INCL. // FOLIATION

LOC 9 HEAD OF CYN
MIXED DK GRAY DIORITE & LT
GRAY QTZ MONZ.
DIORITE MED GR EQUIGRAN ~
50% BIOTITE & HBL + 50% SPAR
MOSTLY PLAG. QTZ MONZ
AS DESCRIBED ABOVE. FROM
E → W QM LESS ABUND. FORMING
DIKES CUTTING DIORITE WITH ABUNDANT
PICTURES → INCLUSIONS 2 PHOTOS.
IN THIS ZONE SEVERAL LARGE
SEPTA DK GRAY FINE GR →
TO BLACK

(21)

HORNFELS TRENDING NW IN DIORITE
HORNFELS WEATHERS DK RED
(HEMATITE) PRODUCING IN
LARGE RED COLOR ANOMALY
EASILY SEEN ON AIR PHOTO +
FROM DISTANCE.
NO VEINS NO MINERALIZATION
OF HORNFELS
HORNFELS BANDED (1-2cm) N60W 50SW
INTRUSIVE CONTACTS // BANDING
CLIFFS TO WEST LOST BURRO FM.
HORNFELS MAY BE REST SPRING SH (?)

12/16 MOVE TRAILER FROM
SAN LUCAS CYN TO HUNTER MTN

PM RECON. SALINE VALLEY
+ ROAD EAST TO RACETRACK

LV. SALINE 1730 HRS ARR LONE
PINE 1900 HRS
NIGHT IN DOW VILLA.

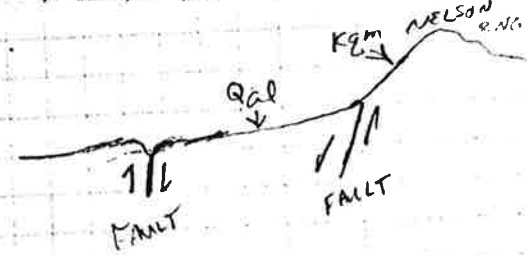
12/17 LV. LONE PINE 0900
ARR. RIV. 1330 HRS

(22)

1/17/77 LV RIV 1030 HRS.
ARR HUNTER MTN 1530 HRS

1/18 ROAD LOG

2US84.3 HUNTER MTN TRAILER
584.9 JCT SALINE VALLEY + HUNTER MTN RD
TAKE LEFT FORK SALINE VALLEY
591.2 FENCED AREA ~ 100 YDS SQ BUREAU SIGN
" BURRO STUDY EXCLOSURE
592.8 CROSS WASH HAIRPIN TURN
93.1 TAKE SIDE RD WEST
93.4 SIDE RD ENDS IN OPEN AREA - CAMPSITES
SURFACE HAS BEEN BULLDOZED
NW & SE EVIDENCE ON AIR PHOTOS
OF FAULT IN QAL TRENDING
~ N30W. LITTLE SEEN ON GROUND
TO NW BUT SE FAULT APPEARS
RECENT FAULTING → TO FOLLOW WASH AT ~ 90° TO
PREVAILING DRAINAGE DIRECTION
ALLUVIAL PLAIN ~ 20' HIGHER ~~[illegible]~~
EAST OF FAULT THAN WEST



(23)

593.7 RETURN SAL. VLY RD NW
95.6 RD EAST TO SPACEBASE CONT. NW
606.35 TAKE RD SOUTH
06.6 VERT. SHAFT, WOODEN FRAME OVER IT, LADDER, CONCRETE COLLAR 60' TO WATER
7.65 LOCKED GATE NO TRESPASSING SIGN
WALK TO BIG SILVER MINE
~ 500 YDS UP HILL IS MINE CAMP
STORAGE CABIN ROCK WALLS, TIMBER & ROCK ROOF ~ 4M X 2M. OLD WOOD BURNING STOVE, FLAT BED TRAILER W. METRO MINE INC PAINTED ON IT.
TRAMWAY W. ORE BUCKET GOES UP SCARP ~ 300 YDS (~ 300' VERT) TO SHAFT S 50 W, SIGN ON ROCK "1972 METRO MINE"
RD SWITCHES BACK & GOES UP SCARP TO ADIT ~ 100 YDS S30 W FROM CAMP
CORNER MARKER AT SWITCHBACK "NE CORNER METRO NO. 1"

AT END OF RD ADIT S 60 W SPLITS INTO 2 DRIFTS 110' IN
AT LEAST 400 FEET OF DRIFTS
RX HIGHLY SHEARED & FAULTED
GRAY & WHITE BANDED LS. W. SOME DK GRAY SH. INTERBEDS.
DONT KNOW WHICH FORMATION

(24)

NO MINERALIZATION SEEN UNDERGROUND
+ NO MINERALIZED RK SEEN OUTSIDE
ADIT. IN FACT THERE ISN'T EVEN
A DUMP — ALL MUST HAVE SLID
DOWN HILL

FROM ADIT
FOOT TRAIL SWITCH BACKS UP SCARP
TO 2ND ADIT AT HEAD OF TRAM
ADIT DUE WEST IN HIGHLY SHEARED
BANDED LS + SH W SOME DIKES
WHITE QTZ MONZ + GRAY DIORITE.
AT PORTAL QTZ VN 60 cm THK
STR. E-W DIP 60° S. SCATTERED
PYRITE PSEUDOS THROUGHOUT VN
+ SMALL POCKETS MALACHITE
ALONG WALLS. ALSO SOME REMNANTS
OF GALENA SEEN BUT NOT COMMON
QTZ CRSLY XLN MILKY QTZ, NOT
VUGGY. PROBABLY REPLACEMENT.
ADIT GOES IN MORE THAN 150'
STOPE UP VN ~30' 60' IN
FROM PORTAL

VN CONTINUOUS
AT 150' SEEN

AMENDED LOC.
LOCATION NOTICE: 1100' NW + 400' SE
GIVES LOC. 2000' FROM BM 1090 + 2500'
FROM CRAIG S IN T15S R33E
FORMERLY BIG SILVER. OWNERS
WORKING CLAIM + FILING ASSESS. WORK SINCE 1968.
AMENDMENT TO CORRECT LOC. FROM T14S TO 15S

(25)

ORIG. CLAIM FILED 29 SEPT 68
& REC. 30 SEPT 68 BOOK 105 P. 411-
LOCATOR FRED STOREY NO ADDRESS

NOTE: MUCH OF ORE PROB. OXIDIZED.
CDMG BULL 47 SAYS PRODUCED
SOME Ag, Pb, Cu, Au in 1928

1/19/77

Mileage
24653.9 JCT SALINE VALLEY RD & BIG SILVER –
TRAMWAY ROAD. W. ON S V RD
55.3 ARTESIAN WELL RD RT. NOT ART. WELL SPRING FED TANK
55.8 RETURN S.V. RD NORTH
55.9 REMAINS OF CRUSHING & CONCENTRATING
OPERATION ON W. SIDE RD. RAMP & CHUTE
TO STEEL ROCKING CRUSHER, 2 CONCRETE
PADS ~ 2 M SQ. 1 TRENCH BELOW
CRUSHER. PICTURE W F. KNOX

56.3 RD W TO HUNTER CYN. SPRINGS, E TO
SALT LAKE. CONT. N.

57.0 RD NE SIGN WATER 2 MI. WARM SPR. RD.
58.8 RD W TO BEVERIDGE
59.25 SIDE RD NE (TO DAN'S = MORNING STAR)
.9 SIDE RD NE
.1 FORK TAKE LEFT FORK

→

ORIG. CLAIM FILED 29 SEPT 68
+ REC. 30 SEPT 68 BOOK 106 P. 411
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NOTE: MUCH OF ORE PROB. OXIDIZED.
CDMG BULL 47 SAYS PRODUCED
SOME Ag, Pb, Cu, Au in 1928

1/19/77

Mileage

21653.9 JCT SALINE VALLEY RD & BIG SILVER —
TRAMWAY ROAD. W. ON SV RD.
55.3 ARTESIAN WELL RD. RT. NOT ART. WELL SPRING FED TANK
55.8 RETURN S.V. RD NORTH
55.9 REMAINS OF CRUSHING & CONCENTRATING
OPERATION ON W. SIDE RD. RAMP & CHUTE
TO STEEL ROCKING CRUSHER, 2 CONCRETE
PADS ~ 2 M SQ. 1 TRENCH BELOW
CRUSHER. PICTURE BY F. KNOX

56.3 RD W. TO HUNTER CYN SPRINGS, E TO
SALT LAKE. CONT. N.

57.0 RD NE SIGN WATER 2 MI. WARM SPR. RD.
58.8 RD W. TO BEVERIDGE
59.25 SIDE RD NE, (TO DAN'S = MORNING STAR)
59.5 SIDE RD NE
.1 FORK TAKE LEFT FORK

→

(26)

60.7 TAKE SIDE RD WEST
61.7 LOCATION MONUMENT
SNOWFLAKE MILLSITE
LOCATED BY ALAN AKIN, DAN DICKMAN,
FRED STORY
T 14 S 38 E
CORNER 1 : 660' SE CRNR 2 330 NE CRNR 3
660 NW CRNR 4, 330 SW CRNR 1
5 ACRES
LOC. 15 SEPT 1975

SITE HAS ORE LOADING CHUTE
FRAGS. FINE GR. WHITE — PALE GREEN
TALC UNDER CHUTE. LOADING CHUTE
LOC 1 PHOTO 7-638

62.1 STEEP PITCH ABOVE FIRST SWITCHBACK
BLOCKED BY SEVERAL ROCK FALLS. WALK.

RD CLIMBS RIDGE BTWN BEVERIDGE +
KEYNOT CYN. ~1-1½ MI. TO SNOWFLAKE
TALC MINE. ROCK ALONG ROUTE
ENTIRELY LT GRAY MED GR BIOT.
QTZ MONZONITE (HUNTER MTN QTZ. MONZ.)
BIOT (5-10%) QTZ 15-20% + APPROX =
KSPAR (PINK) + PLAG. (WHITE) SEEMS
VERY UNIFORM COMPOSITION. NO MAFIC
INCLUSIONS BUT OCCASIONAL SEPTA
GRAY FINE GR. DIORITE

→

(27)

LOC 2 PHOTO 7-639

SNOWFLAKE TALC MINE.

PENDANT WHITE MED GR. MARBLE
IN HUNTER MTN QTZ MONZO ELONG N.
WITHIN MARBLE BODY WHITE TALC
~200' LONG N-S BY ~60' E-W. QUARRIED
AT 4 LEVELS, ~50' VERT. DIST. ONE ADIT N30E
TALC IN VNS LYING SEVERAL DIRECTIONS.
N30E 60 NW, N75W, 20 NE, +
OTHERS. VNS. PROBABLY CONTROLLED
BY JOINTS IN ~~M~~ MARBLE. VNS
FEW CM TO ~3 MTRS THICK.
TALC MOSTLY LT GRAY VERY PURE
SOFT + SOAPY BUT W. SOME SMALL BLACK
FLECKS IN IT. ALSO SOME
WHITE + PALE GREEN TALC
BUT NOT COMMON. ALSO A 15'
PIT ON W SIDE OF RIDGE W SIMILAR TALC.

LOC 3. 7-638

ABT 1/4 MI S70W ACROSS DRAW
2nd OPEN CUT IN TALC AT
CONTACT QTZ. MONZ. + MARBLE
(QM TO EAST OVERLAIN BY MARBLE
CONTACT ~NS DIPPING MOD. WEST.
TALC ZN ~200' N-S x ~70' E-W
CUTS ~30' DEEP. TALC SIMILAR
TO LOC 2 ALSO SHAFT + HEADFRAME

(22)

1/20/77

SALINE VALLEY RD TO BEVERIDGE CYN TURNOFF 2.9 MI. N. OF FREEMAN WELL.
WEST UP BEV. CYN RD.

24717.4 HOUSE AT MOUTH BEVERIDGE CYN.
18.9 KAREN MILLARD WATCHING PLACE FOR OWNER "JACKASS" ANDY KRISTOFIAC (SP?) WHO HAS CLAIMS UP BEVERIDGE CYN. SHE COULDN'T GIVE INFORMATION ON CLAIMS BUT SAID ANDY WOULD BE BACK NEXT WEEK. OTHER INFO. FRED STORY LIVES AT HUNTER CYN, DAN ~~A~~ (DICKMAN?) AT MORNING STAR. LAST SEPTEMBER FULL CREW WORKING IN MINE AT WILLOW CREEK. TALC NOW BEING TRUCKED OUT.

DROVE NORTH TO THE DUNES. FIELD OF TRANSVERSE DUNES WELL STABILIZED BY VEGETATION. PREVAILING WIND FROM NORTH. SAND FINE GR. MOSTLY QTZ, ~20% FELDSPAR + ~2% DARK MNRLS. (CHIEFLY BIOTITE + HBL MINOR MAGNETITE, HEMATITE) DOUBTFUL ANY ECONOMIC BLACKSAND.

→

LV. SALINE VALLEY 1730; ARR.
LONE PINE 2015 HRS.
NIGHT IN DOW VILLA.

1/21/77 LV. LONE PINE 1000 HRS;
ARR RIV 1430 HRS.

1/24/77

LV RIVERSIDE 1000 HRS. ARR
RIDGECREST 1230 HRS.

P.M. DROVE TO TRONA CHECK ON
WHO IS LOCATING CLAIMS IN
PANAMINT VALLEY. ACCORDING
TO MGR. PIONEER POINT MOTEL,
INBERG SURVEYING CO, INC.
516 E. MAIN
P.O. BOX 230
RIVERTON, WYOMING 82501

THIS OUTFIT WAS WORKING IN
AREA ABOUT 1 MONTH. LEFT
TRONA JAN. 12.

RETURN TO RIDGECREST. OUTCROPS IN
CYN. BTWN. TRONA + RIDGECREST SIMILAR
TO TEUTONIA QTZ MONZ.
NIGHT MIDWAY MOTEL RIDGECREST.

1/25
LV RIDGECREST 0800 HRS.

ANTON + POBST PROPERTY
(MCALLISTER) NELSON RANGE
EAST OF LEE FLAT.

ROAD STILL HAS SNOW ON IT
COULDN'T DRIVE ALL WAY.

CHIEFLY GROSSULARITE - EPIDOTE TACTITE.
SOME MARBLE. INTRUDED BY
HUNTER MTN QTZ MONZ.

AT ANTON + POBST INTERLAYERED
WOLLASTONITE SCHIST + GROSSULARITE
TACTITE. WOLL. SCHIST MINERALIZED
W CHALCOPYRITE (~15-20%)
CP INTERSTITIAL + MOLDS AROUND
ELONGATE WOLL. XLS.

OPERATION OPEN CUT IN HILLSIDE
~ 50' NE-SW + ~ 15' HIGH.
A LOT OF CHALCOPYRITE +
CHRYSOCOLLA.

VERY RICH IN CHALCOPYRITE. POSSIBLE
WOLLASTONITE MAY CREATE
MILLING PROBLEMS.
SEE NOTEBOOK #2 (MCFARLAND)

(21)

LV. LEE FLAT 1400 ARR
BIG PINE 1600 HRS.
NIGHT W BRISTLECONE MANOR
MOTEL

1/26/77

MI. 15824.8 BIG PINE → MARBLE CYN WAUCOBA SPR. QUAD
JCT MARBLE CYN + SALINE VALLEY RD (OPAL
CYN) EAST DOWN MARBLE CYN.

25.9 RD S. UP JACKASS CYN.
26.6 ENTER JACKASS FLAT
28.55 FORK NE CRNR S27 TAKE LEFT FORK
29.7 FORK 2 LEFT FORK GOES EAST TO DEVLACE
CONT. S. ON RT FORK
31.05 FORK 3 TAKE RT FORK
31.15 WK JEEP TRAILS RT + LFT. MARKER: "CENTER END LINE MORNING STAR #2"
31.5 FORK 4. MILLSITE OLD CONCRETE
FOUNDATION - 3 LEVELS, MACHINERY PARTS,
PART OF SHAKER TABLE, 55 GAL DRUMS

SW SE S2 11 S 37E SERIES OF SHALLOW TRENCHES, SCRAPINGS
+ PROSPECTS EXTENDING WSW
FROM MILL SITE ~200 MTRS
EXPOSE 1 M. WIDE QTZ VN IN →

(32)

CAMPITO FM. MOTTLED WHITE & GRAY
~~FM~~ FINE GR. QTZ. GREASY LUSTER.
VN BRECCIATED ALONG 3-5CM WIDE ZNS
CUTTING ACROSS VN VARIOUS ANGLES.
FRACTURES COATED YLLW.-BRWN & RED-
BROWN LIMONITE. WALL ROCK SHEARED
NEXT TO VN. NO ECON MNRLS. MAY HAVE
SOME GOLD? VN N70E, 90°
CAMPITO FM THINLY LAMINATED (~5mm)
SILTSTONE & SANDSTONE. HARD &
WELL CEMENTED. FORMS POOR OUTCROP
MOSTLY BLOCKY RUBBLE COVERED KNOLLS.
LOC. MON. W END. LINE OF PROSPECTS. OLD. NO NOTICE
TAKE TRAIL NE DOWN HILL INTO VALLEY &
THEN WSW UP VALLEY

32.1 OLD SHACK SW¼ SW¼ S.2 11S 37E
INSIDE CABIN COPY OF QUITCLAIM DEED

→ JOHN L & VIOLA W HOLT QUITCLAIMS UNTO
GEORGE F. HILL, HERMAN FLOYD &
SAM L. BLAIR. MARCH 26, 1956

3 CLAIMS MORNINGSTAR NO'S 1,2,3
RECORDED INDEPENDENCE 12/14/46
VOL. 59, P. 116 + 117.

NOTE SAYING ASSESSMENT COMPLETE
SEPT. 1 1973. ALSO NOTE W →

JUST A DATE AUG 28 1976.
NEWSPAPERS FROM FEB & MARCH,
1975 IN CABIN.

~ 90 MTRS SE FROM CABIN
VERT. SHAFT ~ 20' DEEP W/
CAMBRITO FM NO VN.

~ 30 MTRS S70W FROM SHAFT
PARTLY CAVED ADIT. AT LEAST
20' FOLLOWS 30 cm THK QTZ
VN. SW VN N45E 85NE.
FINE GR MILKY QTZ, CASTS OF
PYRITE CUBES UP TO 5 mm + 10%
W SOME REMNANT CELLULAR FEOX.
HEAVY COATINGS RED-BROWN to BLACK
CELLULAR GOETHITE. QTZ BRECCIATED

MAY CONTAIN GOLD.

MONUMENT ABOVE ADIT
MORNING STAR # 1.

1/27 LV BIG PINE 0830
ARR RIV 1400

NOTEBOOK IV

RECORDER: R. KNOX

— UNLESS OTHERWISE STATED TRUE ROAD MILEAGES —
— ARE 1.14 X LOG MILEAGE — THIS BOOK —

PAGE	LOCALITIES AND PHOTOS.
1–4	CERRUSITE Pb Mine + Assoc. Cu Mines. LEE FLAT — NELSON RNG CM000 15-319
5–8	WILLOW CREEK CAMP AREA — TALC — DORIS D., GREY EAGLE, WHITE EAGLE CM000 6-681
7	FREE STONE? MILL HUNTER CANYON
9–11	WAUCOBA TUNGSTEN MINE CM000 6-674
12–15	BUNKER HILL MINE CM000 5-710
16–18	BLUE MONSTER MINE CM000 5-710
19–20	LUCKY BOY MINE (BLUE MONST. AREA) 5-710

①

1/5/77 ACCESS TO CERRUSITE MINE

MILEAGES WITH: POWER WAGON P.U. I113991
w/ 14% OVERSIZED TIRES

0.0 JUNCT. LEE FLAT RD AT SALINE VALLEY RD
3.4 JUNCT. L.F. Rd w/ Rd TO LUCAS CAN.
take rt. fork.
6.3 FORK - rt. turn off to
6.55 Fork - rt. turn off to CERRUSITE MINE
6.85 BY PASS FOR ROUGH RD. STAY Rt.
leads back to Cerrusite
also continues on towards "Anton & Pabst" mine and other prospects.

1/18/77
49.5 Junct. L.F. rd. w/ San Lucas Can Rd. -
53.3 road to Anton + Pabst - impassible - snow

Air PHOTO: CM000 13-398 UNNAMED MINES
Loc. 1 ls → rexl. calcite → a. epidote qtz rk.
(gen. steep W. dip) b. epid., gar., calc. rk.
c. "chalcedonic qtz" + calc. rk.

CU. STAINS IN TACTITE

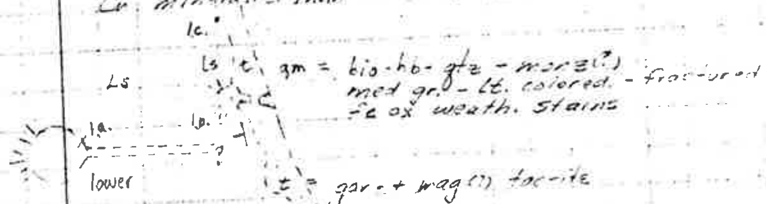
intrus. rx = bio (5), hb (5), K (10-20), plag (~70)
dark, f-m. gr., grn cast.

②

7/18/79 CM00D 13-395

1a. lowermost adit N90E ; struct. at portal N85W 80S - ls. - alt. ls - [est. 90-100' to face]
dump = argillite?, gar. rk., rextl. ls., some epid. rk
all w/ minor Cu stains ; mala, az, chrysoc(?).

1.b. upper prospect (caved adit) ~50' vert. above lower adit N75E (approx) from lower portal to upper.
tact. (gar) ~15-20' thick + more intense exposures Cu mineraliz. than at 1a.



1c. small prospect in tact., calc.-silicate rk zone ~60-70' NW of 1.b. - same elev. minor flt. N75E 75N.
Cu. mineraliz. in gar. rk. (w/ mag - hem)
4x4 claim post - no papers.

1. d. ~400 FT. NW (& 50-80' lower in elev.) ls/gar. rk contact. small excav. ~200 cu. FT. at surface -
Cu min pod in tact. - minor struct & N10E ~vert.
- looking up hill → tact. exp. ~200' ± on surface
- metal flume (visible on air photo) from 1.d. to 1e.
- 2nd pit 30' NW of 1d. - struct. N55E 80NW.
in tact. w/ Cu. on this struct.
fe.ox. pod ½" x 1" - prob. after cpy - in tact.
earthy blk min. → poss. chalcocite?

(3)

1/18/77 | Cn 200 13-398

1.2. lower workings at near Flume - not visited.

Loc 2. small diggings in slt. ls-tact. - open cut ~15' long ≈ S25E - small dump lots of Cu stained rk - [illegible] nearby - gar rk (lt. yel-brn gar + [illegible]) w/ py + cpy → feox + cu carb, but py, cpy remnants also rhodonite + qtz &/or calc. (?) blebs.

CU. STAINS + PY, CPY REMN. IN TACTITE

Loc. 3. small open cut <300 cu ft. - cu stain. - "border facies" qm - various textures + mineralogy. - prob. small tact. zone - some gar. rk. - surr. area = QM.

2 other small cuts ~200-230' S15W from Loc. 3 on crest of WNW trending spur - also minor Cu stains in "qm".

SEVERAL ROCK MONUMENTS IN AREA OF LOC 1, 2, 3 w/ SILVER PAINT - PROB. 2-4 years old.

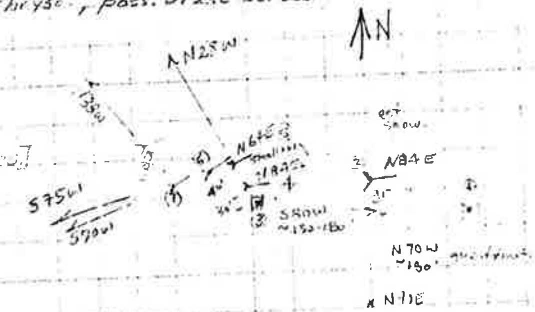
④

1/18/77 CMOOO 13-378

Loc 4 : CARRUSITE MINE - noted ga., py, cpy, hem, mal., az., poss. chrysc., poss. drusy cerussite on float.

GALENA, PY, CPY
ASSOC. MIN.
META SEDS
NEAR CONTACT
W/ INTRUSIVE.

[all distances
very rough
eyeball guessed]



1. not visited
2. covered w/ snow - inaccess. (50' vert. below 1.)
3. semi covered shaft (70-100' below #2.)
4. shallow (small dump) drift 30' from 3. (same level as 3)
5. partially caved - dist. to face unknown. (do)
6. S75W 40 FT from 5 (20' lower) N60E adit // struct. 67 NW
   - minor galena, v. minor py., tr. cpy. on dump.
   - in-determ. dist. to face -
   - hornfels at portal.
7. S70W 50-60' horiz, 50' lower than ⑥
   - portal partially caved - crawl space - N60E
8. N38W ~75' horiz. + 6 FT below 7.
   N70W adit - at road level.

#6 workings had only ga., py, cpy observed. minor Cu stains elsewhere. - No workings examined - dumps examined in a hurry + fading light.

(5)

TALC.

1/19/77 WILLOW CR. DIST. 2M000 6-457

DORIS D. MINE

LOC 1.

ACCESS ~1 MI BY WELL MAINT. DIRT RD. WEST FROM SALINE VALLEY ROAD AT A POINT ~0.6 MILE S OF ROAD TO GREY EAGLE TALC MINE

SO. END W. C. DIST. — EXTREMELY RUGGED TERRAIN — ONE 100 FT. (EST.) VERT. WATERFALL (AND 30 FT WATERFALL ALL) STEEP FOOT PATHS TO TOP WORKINGS — HOISTS, CABLES, TIMBERS, RAILS, ETC. — ALL MUST HAVE BEEN CARRIED IN A PIECE-AT-A-TIME AND ASSEMBLED IN PLACE — INCREDIBLE THAT THE DEPOSIT WAS DEVELOPED AT ALL.

TALC IN REXL LS + DOLO. NEAR INTRUS. CONTACT

A. UPPER MOST WORKS GUESTIMATED 70' (HEIGHT) X 30' (THICK) X 40' (WIDTH) max. dimen. OPEN PIT. — TALC, INTIM. MIXED W/ REXL. LS. &/OR. REXL. DOLO. — POSSIBLY MAIN POD = MASS. TALC W/ WASTE ON FRINGE OF MIXED CHARACTER. — HOST RX = ORG-BRN WEATH., WHT. TO PL. BLUE TO PL. GRAY., C. GR. (2mm to 5mm B.D.), CALC., DOLO., & (?) MAGNESITE. — HOST RX, REL. UNIFORM COL, WEATH. PAT, GRAIN SIZE OVER VERT. RANGE 1×10^3 FT. ± AND $1-2 \times 10^3$ FT HORIZ. — HOWEVER, AREA IS STRUCT. COMPLEX & PETROL. OF NEARBY INTRUS. EXTR. VARIABLE. (FLOAT) — SOME MINOR EXPOS. MAFIC DIKES ETC. —

QUAD MAP ⇒ D.C. ROSS APPROPRIATELY MAPPED ENTIRE AREA AS Pz UNDIVIDED (GQ-612). (WAUCOBA WASH QUAD)

B. AT MAIN HOIST LEVEL - MAJOR (?) UNDERGROUND WORKS - TIMBERED

⑥

CM??? [illegible]

1/19/77

1.C. 250 FT. VERT. BELOW MAIN HOIST STA.
2ND ADIT - SINUOUS - HEAVILY TIMBERED -
TALC IN CARE, HOST. — 3-4 FT WIDE ADIT
~50 FT LONG.

OTHER SMALL SHAFTS + SCRAPES AT
LOWER ELEV.

ORE BIN AT ROAD LEVEL
~ 14 X 8 X 8 X ½ ≈ 450 CU FT. ≈ 40 TONS

NOTE: PROXIMITY OF PAT KEYES PLUTON
(SEE ROSS - USGS GQ-612) AND EXTENS.
REXL. OF LS/DOLO. SUGGESTS THIS
AREA FOR W EXPLORATION - PANNING + GEOCHEM.
OF FANS, BLACKLIGHT EXPL. OF OTC.

THIS TALC IS PALE GREEN

Loc 2. GREY EAGLE TALC MINE
ACCESS FROM SALINE VALLEY RD BY 0.5 MI. SL.
ROUGH, BUT APPARENTLY MAINTAINED, SERVICE [illegible]

ORE BIN 14 X 10 X 6 = 840 CU FT ≈ 75 TONS
10 INCH ORE FLUME PIPE

ORE NEAR BIN - LT. TO DK. GRY, PALE GRN, WHT.

(7)

CM000 6-669

1/19/79.

LOC. 2. GREY EAGLE TALC MINE (CONT'D.)
ACCESS TRAILS TO WORKINGS NOT IMMED.
OBVIOUS. MAN WAY VIA CABLE CART
SEE NEXT PAGE (8)

CM000 8-580

1/20/79
CM000 8-580

HUNTER CANYON – [illegible] (OWNER)
RENEWED ACTIVITY AT OLD MINING [illegible]
MILL SITE – LOC. 1.0 mi. W of
Saline Valley Rd about 1/4 mi. N
of Artesian Well [illegible]
Lake.

LOC. 1. OLD [illegible] = 4-5 wood frame [illegible]
+ 4 old trailers + assorted equip
& auto hulks plus probable old
ball mill site – COMPLETELY DISMANTLE
NOW – GOOD SUPPLY OF WATER
(SPRINGS). – OLD WORKS MAY
HAVE INCLUDED NEW SITE AS WELL.

LOC. 2. NEW SITE ~ 1/4 - 1/3 MILE E OF OLD
BALL MILL. ASSORTMENT OF OLD &
PARTLY RENOV. EQUIPT. INCLUDING
GRIZZLY, JAW CRUSHER & CONVEYOR PLUS
PIPE SYSTEM TO STEEL CONE ORE
BIN – ALL LOOKS COMPLETE &
READY TO GO – ALSO A SHAKE
TABLE (DRIVE SYSTEM INCOMPLETE) AND
SMALL SHOP BLDG. – NO ORE STOCKPILE,
NO CONCENTRATES, NO OPERATION, AS YET.

8

[illegible] [illegible]

[illegible]

Loc. 2

GREY EAGLE TALC MINE

Access via rough side road about 1000 – 1500 FT. S. OF WILLOW CRK CAMP THENCE TO EXCELLENT FOOT PATH TO MAIN DUMP STATION.

UNDERGROUND WORKINGS ON SEVERAL LEVELS. –

COUNTRY ROCK = COARSELY REXL LS + DOLO. + WHT TO DK GRY SULF. BEARING QTZ RK. – LS + DOLO IS SIMILAR TO THAT AT DORIS D. (COLOR, TEXT, GR. SIZE)

FAULTS REPEAT SECTION IN MINE AREA. – LOTS OF THE "BULL QTZ" IN IMMED. VICIN. MINE.

– WATCHMAN FOR WHITE EAGLE REPORTS SUPPOSED LARGE RESERVES OF TALC IN LOWER WORK GREY EAGLE MINE – EFFECTIVELY BLOCKED BY MINE-OUT NEAR PORTAL FOLLOWED BY COLLAPSE.

~130 x 40 x 40 FT PIT (L x W x D) ~ 30° to horiz.

TALC IN [illegible] LS + DOLO. W/ ASSOC. QTZ RK.

⑨

21/77	BIG PINE CA — TO WAUCOBA TUNG...
86.5	Big Pine – junct. 395 w/ Westgard Pass Rd
88.5	Turn S. at junct. w/ Waucoba, Saline Valley
00.0	junct w/ Saline Valley Rd. (dirt)
07.0	junct. No signs chose rt. fork
09.5	Rock bench mark 6986.0 – left side of rd. ~10' from roadway.
13.9	junct. rd to Waucoba Spring go straight
15.65	Turn off to ...
16.1	mine workings.

W.T.

CM000 6-674

fine gr. sch?

N22°E 62°SE on cleav. – flaggy rk.

N35°E 30°SE bdd. same, etc.

Specimen # WTM 1. – loc. 210 FT N20°W. FROM area of workings

6-674

D.C. ROSS MAPPED AREA AS HARKLESS (E) FM (ARGILLITE) – No CTC AT MINE – HILL SIDES + ROADS LITTERED

SEE: Norman & Stewart, Cal. Div. Mines, Jour. v. 47, 1951.

⑩

[illegible]

CH000 6-STA

QTZ VEIN w/
Cu STAIN

WITH LOTS OF QTITE BLUE &
AT MINE. SOME LAMIN. DK GRAY TO
FINE GR. REXL LS. OR DOLO? FLOAT
OLIVE - GRN-GRY. SH. CHIPS.
POSS. TUFFAC. RK. FLOAT

FOUNDATIONS FOR SMALL MILLSITE
VARIOUS DEBRIS REMAIN.

TWO INCL. SHAFTS OF UNDETERM. DEPTH —
STILL OPEN. — WORKINGS ON 2 BENCHES
UPPER IS 10 FT. ABOVE LOWER.
BOTH COLLARED IN COLLUVIUM
INCL. SHAFT ON UPPER BENCH
53° ON S.67E HEADING — HAS
WOOD COVER — PROB. ASSOC. DUMP
HAS F. GR. SED. RX w/ MINOR Cu-Stain
SOME WHT QTZ w/ FEOX STAIN ON FRACT.

INCL. SHAFT ON LOWER BENCH — OPEN
EST. TREND N.70E. — BUT SHALLOWS
TO ROOM OR DRIFT ~ 15 FT. BELOW
SURF. — ASSOC. ROCK PILE:
LOTS OF QTZ w/ Cu. STAINS —
MOSTLY CHRYSOC. (?)
RD-BRN. TO BLK. JASPEROID
CANARY YELLOW COATING ON SOME QTZ.

NOTE: THERE SEEMS OF [illegible]
TO SOME QUESTION AS TO [illegible]
OF THE "DATE" PRESENTLY ON DUMP-
ESPECIALLY AT THE LOWER INCL. SHAFT.

11

1/21/77

~ 75' N45°W FROM LOWER SHAFT TO UPPER.

LOWER [illegible] HAS [illegible] OF EXTENSIVE POST MINING DISTURBANCE - possible SMALL PITS + SHAFTS; PROBABLY DEMOLISHED

TOTAL AREA OF MINING ACTIVITY ~ 200' E-W BY ~ 120' N-S.

CONCLUSIONS -

1. WORKINGS ARE SMALL AND ISOLATED FROM OTHER [illegible] MINES.
2. HOST ROCK NOT CONCLUSIVELY KNOWN - PROBABLY MARBLE [illegible] FM. BY INFERRENCE - IF D.C. ROSS MAPPING CORRECT.
3. MINERALOGY HAS YET TO BE DETERMINED.
4. ORIGIN TO BE DETERM.

∴ CAN'T MAKE ANY INFERENCE REGARDING A "DISTRICT" OR THE AREA'S POTENTIAL - FROM THIS OCCURRENCE.

17.6 RETURN TO SALINE VALLEY RD. TURN S.

⑫

[illegible]/77	WAUCOBA TUNGSTEN TO BUNKER HILL MINE.
20.5	X-ROADS: SALINE VALLEY RD w/ TRAIL W. TO SMALL UNNAMED (UNNAMED) MINE. & TRAIL E WHICH RUNS AROUND TO WAUCOBA WASH — GO STRAIGHT (...
21.65	Road to BUNKER HILL & BLUE MONSTER MINES — RT. TURN — large blue painted rk
22.85	FORK — RT. FORK IS LESSER ROAD — ASSUMED TO BE BUNKER HILL RD. — DO NOT USE!! AT 23.3 AFTER ROUGH RIDE REJOIN GOOD ROAD.
23.9	Gate on rd. + "BUNKER HILL MINES 4.28.1975" —
	BUNKER HILL & BLUE MONSTER MINES LOCATED ON CM[illegible] 5-710
NOTE:	FROM USGS — ROSCOE SMITH —
	BUNKER HILL = Pb, Ag, Au. 1920
	BLUE MONSTER = Pb, Ag, Cu. 1908-21; 1935
	LUCKY BOY = Pb, Ag (?) —

13

1/22/77 Emmet L... Mine C... 5-710

LOCATION NOTICE : "LUCKY JOSEPHINE #1.
SEC. 5, T. 12 S., R. 37 E. Nov. 19, 1974
Arthur L. Lawrence, P.O. BOX 603
VERDI, NV. 89439

LOC. MON. ~30' N. BUNKER HILL CABIN.
2 CORRUG. METAL BLDG ~50 X 15'
2 SMALLER METAL BLDG.
ONE OLD EARTHEN POWDER MAGAZINE
CABLE TRAMWAY w/ BOTTOM DROP
ORE CARTS
WOODEN ORE BIN.
old - PIPED WATER SUPPLY - ASSUMED FROM
SPRINGS UP CANYON.

N N75E 50 N bdd.
tan-brn ls. - rexl f-cgr. - bearing feox after py?
dk gry rexl. siltstn - thin bdd - 1/8" - 2" - laminated.
bdg 2-8"
yel, och, org, brn feox + other ?ox
QITE
BLDG.
QITE
red feox
N43E 15NW
locked gate
QITE
lesser Fe ox.

zones of intense fracturing - prob. w/ v. little differential movement. - also some obvious recemented breccia.

Cambrian

D.C. ROSS' map shows this section
Poleta ls.
Basal Harkless Fm - siltstn
mid + upper Harkless fm - QITE
is UPSIDE DOWN. - GENTLE DIPS

(14)

7/22/77 BUNKER HILL MINE ~~CM 311 5-910~~

OTHER DIRS: LOC. 1 — area of BH. mines.

N75E 65S - est. att. on 2-3' wide vein ~300-400' long. - gossan incls. py - hem. + mass. lim. oxide, some qtz (vein) + brecciated qtz.

— worked at surface w/ shallow pits & short adits ~ 5-10 FT

— NOTED A FEW TINY FRAGMENTS OF GALENA FROM SOMEONE BREAKING LARGER PIECE —

— NUMEROUS ... STRUCTURES.

— AREA IS VERY COMPLEX STRUCTURALLY OVERTURNED FOLDS, LARGE HORIZ. AXIS CHEV. FOLDS, NUMEROUS FAULTS, VEINS NOT UNIFORM, SEVERAL LARGE (1-2') MASS. SULF. VEINS DO NOT CONTIN. OTC. BUT COME W/IN 3-5 FT. SURF.

OPENINGS — TOTAL OXID. MASS. SULF. TO FE OX VEINS IN LS.

— MINE DEVELOPED ON AT LEAST THREE MAJOR LEVELS WITH NUM. SUBSIDIARY WORKINGS + LEVELS.

— TOTAL # MINE OPENINGS NOT DETERM THIS VISIT - PROB EXCEEDS 25.

— TOTAL LENGTH OF WORKINGS NOT KNOWN BUT APPEARS EXTENSIVE >500 FT. MIN.

— # VEINS INVOLVED NOT DETERM. WOULD REQUIRE SEV. DAYS DETAILED UNDERGROUND & SURFACE MAPPING.

— MASS. SULF. VEINS w/ SUBORD QTZ. PROB. ORIG. PY ± GAL. w/ MUCH SUBORD CPY (minor Cu Stain)

(15)

1/22/77 | BUNKER HILL MINE [illegible] 5-20

ALL SURF. WORKS + ALL DUMPS ARE
SUPERGENE MINERALS. - VIRTUALLY NO
PRIMARY MINS. PRESENT —
IF VEINS PERSIST AT DEPTH, ZONE
OF PRIMARY MIN. MAY BE FOUND AT
DEPTH - AT LEAST TO BASE (TOP) OF POLETA.

[illegible]

ACCESS [illegible] IS VIA PACK TRAIL WHICH STARTS
IN GULCH 15 FT E. OF TOWER [illegible]
AND [illegible] INGERSOLL-RAND [illegible]

VEINS DISCONTINUOUS IN DETAIL - IRREGULAR.

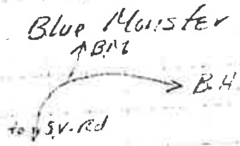
LOC. 2 | SMALL ADIT & DUMP VISIBLE TO NE FROM BUNKER
HILL MINE - NOT VISITED

97.1 | JUNCT. LEAD CANYON RD W/ BUNKER
HILL MINE RD

LEAD CAN. RD BLOCKED .1 MILE
FROM JUNCT.

99.2 | JUNCT. MAIN
SALINE VALLEY RD W/ RD. TO BLUE MONSTER
& BUNKER HILL.

00.65 | Junct. Blue Monster & Bunker Hill Rd's



(16)

/23/77 | BLUE MONSTER MINE [illegible] 5-710

73.65 JUNCT. BLUE MONSTER — BUNKER HILL Rd.

75.8 Blue MONSTER (?) ORE BIN & LOADING DOCK (... WOOD) & 2 SMALL CONCRETE FOUNDATIONS

LOC. 3. SMALL WORKINGS AT OR NEAR FLT. CONT. PEdeep spring fm w/ TAMARACK CAN Fm

[illegible] S/OF BONANZA KING — DIGS IN LS.

NO SIGN OF MINERAL [illegible] — WHAT THEY WERE LOOKING FOR NOT KNOWN

— 3 SMALL OPEN CUTS ∠10' MAX. DIM.

— 1 ADIT — N.65°E. HEADING

LENGTH NOT DETERMINED. ~50 FT ASSUMED.

— another SMALL DIG. ~100' N. NOT INVESTI.

ACCESS — ACCESS TO BLUE MONSTER (LOC 4) IS VIA TRAIL WHICH HEADS UP AT MOUTH OF FIRST MAIN CANYON W. OF ORE BIN AT ROAD. — TRAIL PASSES CLOSE TO LOC 3, BEFORE CUTTING AROUND HILL TO BLUE MONSTER.

(17)

1/22/77 BLUE MOUNTAIN [illegible] QM 999 F-919

LOC. 84

MINOR PY + PY → FE OX.

~N30W 65N — AUTZ VEINING IN LS > QTZ EXWAR AROUND LS. BRECCIA FRAGS. — PERSISTENCE SMALL UNKNOWN — DOES NOT SEEM TO CROSS WASH IMMED. TO E. — BUT ROSS MAP SHOWS FLT. W/ ~10^3 FT OFFSET IN VICIN.

25,000 TO
EST. 27,500 CU FT WASTE ON DUMP ≤10^3 YDS.
6'x5' DRIFT ⇒ 8-900 FT. WORKINGS EST.

AT PORTAL —
ADIT HEADING ~ N32°W. IN SONORA KING LS. — JUST INSIDE PORTAL LS SL. SILIC. W/ SL. REPL. BY WHT FIB. MIN ~ ½ cm x .05-.1 CM. (ARAG. OF WOLL.?)

NO MIN. OR OBVIOUS STRUCT. VEIN AT PORTAL — BUT LS IS RUBBLY + BRECCIATED BUT NOT VEINED.

SPEC. FROM DUMPS ABOUT PORTAL — SOURCE TOTALLY UNKNOWN — GA. IN SMALL QTZ VEINS IN YEL-ORG-OCHRE COLORED REXL LS. (F. GR.)
— SOME CU. STAINS, MALAC., POSS. Ag-green?

Y, MINOR Cu, Fe

— A FEW OTHER MINOR DIGS IN IMMED. VICINITY — NONE SHOW MINERAL OF SIGNIFICANCE.

— NO GOSSAN AS AT BUNKER HILL MINE

(MINE) [illegible]

1/23/77 — BLUE MONSTER

GALENA + QTZ IN LS NEAR INTRUS. CONTACT.

≈ 300 FT N.35°W. FROM PORTAL & 100 FT
UPHILL — OPEN PIT 70' LONG. (N35°W),
20-25' WIDE, HIGHWALL 15'. AT NW END
OF PIT WINZE RAKE ~35° TO NW.
— MINOR QTZ VEINING IN LS — NO GA LEFT
IN FACE — SMALL ORE PILES ON SEAMS
SHOWS QTZ + GA IN LS.

— OTHER MINOR PITS + SCRAPES IN
AREA — NO OBVIOUS ORE.

ORIG. DISCOVERY?

ORIG. DISCOVERY PROB. MADE IN THIS
(UPPER) AREA — ADIT BELOW DRIVEN
TO INTERSECT. (SURMISE)

PIUTE MON. Q.M. EXPOS. $\sim 10^3 - 1.5 \times 10^3$ FT
TO S. OF BLUE MONSTER.

LOC. 5.

CAMP

PROBABLE CAMP FOR BLUE MONSTER
WORKERS — 3 COLLAPSED WOOD CABINS
2 W/ CONCRETE FRONT STEPS —
1, 10 FOOT ADIT TO NOWHERE — LINED
WITH SHELVES — POSS. MAGAZINE
BUT TOO CLOSE TO HOUSES FOR
COMFORT.

Ⓐ

[illegible]

(NAME FROM TOPO MAP)

73.5 **[illegible] BOY MINE** - LOWER ADIT

[illegible] ~ [illegible] FOR 20' + 15' OPENCUT.

[illegible] TURN TO N 65° W - UNDET. DIST.

[illegible] IN LS. LOOKS (IN PART) GEN. SIM. TO (SOME) [illegible] AT BLUE

MONSTER - BUT THIS IS MAPPED (ROAD)

AS TAMARACK CAN. [illegible]

- POSS. VEIN OR GOUGE ZONE [illegible]

[illegible] MINOR [illegible] IN LS. | V. APPROX. IN DARK [illegible] - HOST = WHT TO

DK GRY REXL CARB. - CLAYS + FEOX STAINS

ON JOINTS.

- ON DUMP - "ORE" = V. THIN. QTZ VEINS

W/ PROB. MINOR GALENA - IN ALT.

YEL-ORG - OCHRE LS (CARB) - V. SIM. TO

BLUE MONSTER.

UPPER ADIT ~ 150 FT UPSTREAM

~ N.40°W. FROM LOWER ADIT.

HEADING S.68°W. AT PORTAL

-> APPROX 50 FT - AT SL. DOWNGRADE

2-4° EST. - MUST HAVE HAD MIDGETS

MINING HERE - BACK VARIES FROM

4 TO 6 FT. - RX SAME AS LOWER

ADIT.

20

[illegible] LUCKY BOY MINE CM 100 [illegible]

FROM UPPER ADIT OF LUCKY BOY

OTHER WORKINGS VISIBLE ON N. SIDE

ESTIMATED. OF CANYON:

LOC 7. → 1 SMALL DUMP N. 10° W.

LOC 8. → 1 SMALL + LARGE DUMPS N. 8° E.

1 SMALL SCRAPE N. 80° E.

NOT VISITED - GETTING MUCH TOO LATE

IN THE DAY.

80.0 JUNCT. BUNKER HILL RD.